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CORRECTIONS

MONTHLY WEATHER REVIEW SUPPLEMENT No. 46. Page [illegible], 1st column, 1st line, for "quiet" read "quite".

MONTHLY WEATHER REVIEW, September 1941, vol. 69, page 264, table 2, line 15 (Twin Falls), 2d column, "U. S. Bureau of Plant Industry" should be "U. S. Bureau of Entomology and Plant Quarantine".

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THE THERMODYNAMIC PROPERTIES OF WATER AND WATER VAPOR

By PAUL J. KIEFER

[U. S. N. Postgraduate School, Annapolis, Md., June 1941]

Extensive international research has been conducted within about the last 10 years for the purpose of ascertaining, with maximum accuracy, the thermodynamic properties of water and water vapor. Experiments were carried out to this end at the National Bureau of Standards, the Massachusetts Institute of Technology, and Harvard University in the United States; and other experiments were conducted by agencies in England, Germany, and Czechoslovakia. By international conferences, the individual findings of these agencies were then collected and cross-checked for consistency by means of the general thermodynamic equations; when inconsistencies were disclosed, the apparatus was investigated and the data redetermined. The final results have been made available in this country in tables of the *Thermodynamic Properties of Steam*, prepared by J. H. Keenan and F. G. Keyes of the Massachusetts Institute of Technology (New York, John Wiley and Sons, 1936).

The range of pressures and temperatures covered by these data extends far beyond that which is of importance to the meteorologist, as the project was sponsored by the American Society of Mechanical Engineers and hence included the properties at the high pressures and temperatures employed in power generation. However, both the extreme care taken and the wide range covered would seem to make the results exceptionally reliable within the lesser range that is of meteorological concern.

From these tables, the writer has therefore prepared the accompanying tabulation of some of the properties of water in the solid, liquid, and vapor states, over the range from −40° C. to +50° C. In preparing this tabulation, the units of temperature, pressure, and energy were changed from those conventionally employed by the engineer in this country to the ones preferred by the meteorologist; and various thermodynamic checks were employed to insure consistency in the results.

The first three columns of the table contain the temperatures and the corresponding saturated vapor pressures and densities; the latter are given both for ordinary equilibrial conditions throughout the temperature range of the table, and also for vapor in equilibrium with subcooled water.

Over the range of the table, the saturated vapor pressures of the liquid phase may be represented with great accuracy by the equation

$$ln\ (p/p_0)=6887\ (1/T_0-/T)-5.31\ ln\ (T/T_0); \qquad (1)$$

or, taking T_0 as the ice-point temperature 273° K. (or more exactly, 273°.16) and p_0 as the corresponding saturation pressure of 6.105 mb., we have

$$ln\left(\frac{p}{6.105}\right)=25.21\frac{t}{t+273}-5.31\ ln\frac{t+273}{273}, \qquad (1a)$$

or $$\log_{10}\left(\frac{p}{6.105}\right)=10.95\frac{t}{t+273}-5.31\ \log_{10}\frac{t+273}{273}. \qquad (1b)$$

Equation (1) conforms to the requirements of the Clapeyron equation (see Brunt, *Physical and Dynamical Meteorology*, 2 ed., pp. 101–104). The form (1b) may be compared with the relation

$$\log_{10}\left(\frac{p}{6.105}\right)=10.78\frac{t}{t+273}-5.01\ \log_{10}\frac{t+273}{273}$$

proposed by Whipple (MONTHLY WEATHER REVIEW, 55: 131, 1927).

For the range of ice-vapor states, Keenan and Keyes accepted the data given by Washburn, MONTHLY WEATHER REVIEW 52:488–490, 1924, although they noted that some thermodynamic inconsistency exists in these data. Slight inconsistencies in this range, however, are of minor concern to the meteorologist because of the very small mixing ratios that are associated with it. The Washburn pressure-temperature data may be represented by the relation

$$ln\ (p/p_0)=4332\ (1/T_0-1/T)+2.31\ ln\ (T/T_0).$$

It may be shown that the requirements of the Clapeyron equation would be more nearly met by a relation of the form

$$ln\ (p/p_0)=6150\ (1/T_0-1/T),$$

or one approaching the Whipple relation for the ice-vapor states,

$$ln\ (p/p_0)=6260\ (1/T_0-1/T)-0.445\ ln\ (T/T_0).$$

The density, pressure, and temperature data in the table show the ratio $p/\rho T$ to be substantially constant, with the value 0.461 joules/(gm., °K.). This fact justifies the commonly accepted hypothesis that water vapor, at the low pressures that are of concern to the meteorologist, may be regarded as a perfect gas; and also confirms the values of the perfect gas constant that have been regularly employed for water vapor in meteorological literature.

The quantities in the next three columns of the table, viz, h_f, h_{fg}, h_g, and h_i, h_{ig}, h_g, are in a sense those that have long been referred to in the literature as, respectively, the "total heat of the liquid (or the solid)," the "latent heat

of vaporization (or sublimation)" and the "total heat of the vapor." It may seem that the use of the above symbols and the technical name "enthalpy" is a matter merely of change of nomenclature; it is, however, somewhat more than that, and the use of a distinctive term such as enthalpy (*ĕn-thăl'-py*) to designate these functions has become virtually universal in the engineering and chemical professions within the last decade.

One reason for the adoption of this practice is that much unnecessary confusion has resulted from the indiscriminate use of the same word *heat* to designate several essentially different quantities, as, e. g.: (*a*) energy which is transferred by radiation or conduction between a system and its environment, producing changes of state in each, but not itself a function of the state of either; (*b*) internal energy, stored in a system by reason of its molecular and atomic state, and depending on the thermodynamic state of the system; (*c*) this stored energy plus the product of the pressure and specific volume, this sum frequently being known as the "total heat"; (*d*) even the temperature, although technical literature cannot be generally accused of this usage.

To avoid confusion, it has now become the accepted practice in engineering literature to employ the word *heat* (symbol, Q) only for the energy that may enter or leave a system by thermal radiation or conduction, just as the word *work* relates only to energy entering or leaving by mechanical processes; this meaning is the one implied in connection with "specific heats" or "adiabatic" processes. Heat, so understood, may not be regarded as a function of the state of a substance.

The energy that is stored in the molecular system of a substance is designated as its molecular or internal energy (symbol, E). Although we have no means for an absolute evaluation of the energy so stored, its relative amount per unit mass is determinable, and is a function of the state of the substance.

The further function of state given by the sum of the internal energy E and the product of the pressure P by the specific volume V is the one referred to above as the enthalpy: $H=E+PV$.

The general significance of this function may be illustrated by the so-called "steady-flow energy equation,"

$$gZ_1+U_1^2/2+E_1+P_1V_1+{}_1Q_2=gZ_2+U_2^2/2+E_2+P_2V_2, \tag{2}$$

a formulation of the principle of the conservation of energy (First Law of Thermodynamics) as applied to a stream of fluid flowing steadily into and out of any selected region. E.g., in a steadily ascending convectional current in the atmosphere, subscripts (1) and (2) refer to a lower elevation Z_1 and an upper elevation Z_2. The quantities gZ_1 and gZ_2 are then the potential energy or geopotential per unit mass at those levels; $U_1^2/2$ and $U_2^2/2$ are the kinetic energies per unit mass (U=velocity); E_1 and E_2, the initial and final internal energy per unit mass; and ${}_1Q_2$ represents the heat energy absorbed or emitted per unit mass between the two levels, vanishing if the process be effectively adiabatic.

The products P_1V_1 and P_2V_2 represent the mechanical energy expended in the work done by the action of the force in effecting the flow of each unit mass against the pressures existing at the two levels: To sustain a flow over a cross section A into a region at pressure P, requires a force PA; the distance L through which that force must act to effect the entry of a unit mass of fluid of volume V equals V/A; and the "flow-work" energy so entering the region is thus $PA\frac{V}{A}=PV$.

Now in equation (2), E, P and V are each functions of the state, so that the quantity $(E+PV)$ must likewise be a function of state; and since the latter quantity must invariably appear in the energy equation for any flow process, it is advantageous to identify it by a single name and symbol—the enthalpy, H. Then equation (2) for steady flow becomes

$$gZ_1+U_1^2/2+H_1+{}_1Q_2=gZ_2+U_2^2/2+H_2, \tag{3}$$

or in differential form,

$$gdZ+UdU+dH=d'Q. \tag{3a}$$

For flow with negligible change of elevation and velocity, $dH=d'Q$ or ${}_1Q_2=H_2-H_1$; i. e., since such flow can occur only at constant pressure, the change of the enthalpy function for a fluid during an isobaric process evaluates the energy concurrently entering or departing by radiation or conduction. This property led to the earlier designation of the function as the *total heat* or *heat content;* but as shown by the following example, it might equally well be called the "total geopotential" or "geopotential content":

In an adiabatic ascent with negligible velocity change, $gdZ=-dH$. If the enthalpy change in such a process be expressed as a function of the temperature change (dT), the lapse rate may be ascertained; for a perfect gas, since $dH=dE+d(PV)$ by definition, and $dE=c_vdT$, we have $dH=c_vdT+RdT=(c_v+R)\ dT=c_pdT$, whence the adiabatic lapse rate is $dT/dZ=-g/c_p$.

The so-called "stream-function" $gZ+c_pT$, which has recently been included in routine daily meteorological reports, is in a limited sense the equivalent of the quantity $gZ+H$ of equation (3); the limitation lies in the fact that c_pT evaluates only the enthalpy of the dry air component of the atmosphere (relative to that for air at 0° abs.). Thus the stream-function does not take into account the very important source of energy which exists in the water vapor component of atmospheric air; whereas, the enthalpy function, properly interpreted as the aggregate enthalpy of the air *and* vapor, takes into account the energy of both components. As an illustration, for air at 10° C. and 2,000 meters height, with a mixing ratio of 10 g./kg., the geopotential is 19 joules per gram and the enthalpies of the air and the vapor are respectively 83 and 27 joules per gram of air (relative to dry air at 200° K.), the vapor thus contributing nearly 30 percent additional energy. The data on the relative enthalpy of water vapor in the accompanying table should facilitate the extension of the stream-function to include the vapor energy and so enhance appreciably the effectiveness of that function in meteorological analyses. If the vapor energy be included in the stream-function, this function becomes highly conservative for *all* adiabatic processes, including those involving adiabatic saturation by evaporation.

Another useful property of this function is the following: Since the enthalpy is a function of the state, it may be employed as one of a pair of coordinates with which the properties and property changes of a fluid may conveniently be represented graphically. Energy may then be ascertained directly, *simply by reading the enthalpy scale,* avoiding the evaluation of integrals or "areas" (such as VdP, PdV or TdS). An "enthalpy-entropy diagram" has therefore become the primary practical indicator diagram of the engineer. The writer has prepared such an enthalpy-entropy diagram for the air-vapor mixtures that exist in the atmosphere.

The particular data listed in the table are the enthalpy

of saturated water (h_f, joules per gram) and saturated water vapor (h_g) at the indicated temperatures; the change of enthalpy (h_{fg}, or the familiar "latent heat," L) for vaporization at those temperatures and the corresponding saturation pressures; the enthalpy of ice (or snow, h_i) and of saturated vapor (h_g) at 0° C. and below, and the change of enthalpy (h_{ig}) for sublimation at such temperatures. The symbols are those currently employed by the engineering physicist and recently standardized by the thermodynamics subcommittee of the American Standards Association. As the internal energy component of the enthalpy function $(E+PV)$ is capable only of relative evaluation, any evaluation of the enthalpy function must also be relative. In order to avoid negative magnitudes, the quantities in the table are relative to an arbitrarily-assigned value of zero for ice at −73° C. (200° K.); the units employed, joules per gram, seem particularly suitable for meteorological purposes. The values in the Keenan-Keyes Tables are in B. t. u. per lb. and relative to a zero for water at 0° C.

Inspection of the table shows that h_{i_g} exhibits a relatively minor variation; the mean value of about 2838 j./g., or 677.9 cal. per gm., agrees well with the value of 677 cal./gm. frequently quoted in meteorological literature. The quantities h_g and h_{f_g} are almost linear functions of temperature within the given temperature range:

$$h_g=2969+1.81\ t°\text{ C.}$$
$$=2477+1.81\ T°\text{ K. j./g.} \qquad (4)$$
$$h_{f_g}=2502-2.38\ t°\text{C.}$$
$$=3142-2.38\ T°\text{ K. j./g.} \qquad (5)$$

From the Clapeyron equation, $h_{f_g}=VT\dfrac{dP}{dT}$, and the gas constant $PV/T=0.461$ for the vapor, we have

$$h_{fg}=3142-2.38T=0.461T^2P^{-1}(dP/dT),$$

that is,

$$\frac{dP}{P}=\frac{3142}{.461}T^{-2}dT-\frac{2.38}{.461}\frac{dT}{T},$$

or

$$ln\ (P/P_0)=6820\ (1/T_0-1/T)-5.26\ ln\ (T/T_0)$$

The agreement with equation (1) is quite satisfactory in view of the general approximations employed. However, some disagreement is apparent between equation (5) and the relation

$$L=594.9-0.51\ t°\text{ C. cal./gm.},$$
$$=2520-2.1\ t°\text{ C. joules/gm.},$$

often given in the literature (see, e. g., Brunt, *Physical and Dynamical Meteorology*, 2d ed., p. 58).

The indicated value of 1.81 j./g. deg. or 0.435 cal./gm. deg. for $d\ h_g/dT$ does not agree closely with the values of about 0.465 that have frequently been quoted in meteorological literature for the specific heat of water vapor at constant pressure; but in view of the reliability of these most recent data, it is to be regarded as the more probable figure.

The remaining columns of the table contain the entropy, in joules per gram, ° Kelvin (or ° C. abs.) of saturated liquid (s_f) or ice (s_i) and of saturated vapor (s_g), and the associated changes of entropy for evaporation (s_{f_g}) or sublimation (s_{i_g}). The values are again relative to an arbitrarily assigned value of zero for ice at −73° C. Although it may not seem conventional to employ such specific magnitudes of the relative entropy in meteorological computations relating to ice, liquid, or vapor and their mixtures with air, the writer has found it very convenient to do so in computations associated with wet-adiabatics.

Thermal properties of water—solid, and saturated liquid and vapor phases +50° to −40° C.

[Values based on results of international research as tabulated by Keenan and Keyes, 1936, but with magnitudes in metric units and relative to zero values of enthalpy and entropy for ice at 200° K., or −73° C.]

Temperature °C	Saturated vapor pressure mb.		Saturated vapor density gm./cu. m.		Enthalpy, joules/gm.			Entropy, joules/gm., ° K.		
					h_f	h_{fg}	h_g	s_f	s_{fg}	s_g
50	123.3		83.1		676	2,383	3,059	2.49	7.37	9.86
48	111.5		75.6		668	2,388	3,056	2.46	7.43	9.89
46	100.9		68.8		659	2,393	2,052	2.44	7.49	9.93
44	91.1		62.5		651	2,398	3,049	2.41	7.56	9.97
42	82.0		56.6		643	2,402	3,045	2.39	7.62	10.01
40	73.7		51.2		634	2,407	3,041	2.36	7.68	10.04
38	66.2		46.3		626	2,412	3,038	2.33	7.75	10.08
36	59.4		41.8		618	2,416	3,034	2.30	7.82	10.12
34	53.2		37.6		610	2,421	3,031	2.28	7.88	10.16
32	47.5		33.8		601	2,426	3,027	2.25	7.95	10.20
30	42.43		30.4		592	2,431	3,023	2.22	8.02	10.24
28	37.78		27.3		584	2,436	3,020	2.19	8.09	10.28
26	33.65		24.4		576	2,441	3,016	2.17	8.16	10.33
24	29.82		21.8		567	2,446	3,013	2.14	8.22	10.37
22	26.40		19.4		559	2,450	3,009	2.11	8.30	10.41
20	23.37		17.31		551	2,454	3,005	2.08	8.37	10.45
18	20.61		15.37		543	2,459	3,002	2.06	8.44	10.50
16	18.16		13.65		534	2,464	2,998	2.03	8.52	10.55
14	15.98		12.09		526	2,468	2,994	2.00	8.59	10.59
12	14.03		10.68		517	2,473	2,990	1.97	8.67	10.64
10	12.28		9.41		509	2,478	2,987	1.94	8.75	10.69
8	10.73		8.29		501	2,482	2,983	1.91	8.83	10.74
6	9.35		7.27		492	2,487	2,979	1.88	8.91	10.79
4	8.13		6.37		484	2,492	2,976	1.85	8.99	10.84
2	7.05		5.56		475	2,497	2,972	1.82	9.07	10.89
0	6.105		4.85		467	2,502	2,969	1.79	9.16	10.95
	Over water	Over ice	Over water	Over ice	h_i	h_{ig}	h_g	s_i	s_{ig}	s_g
0	6.105	6.105	4.85	4.85	134	2,835	2,969	0.57	10.38	10.95
−2	5.27	5.17	4.22	4.14	129	2,836	2,965	0.55	10.45	11.00
−4	4.54	4.37	3.66	3.53	125	3,836	2,961	0.54	10.53	11.07
−6	3.90	3.69	3.17	3.00	121	2,837	2,958	0.52	10.61	11.13
−8	3.34	3.10	2.74	2.54	117	2,837	2,954	0.51	10.69	11.20
−10	2.86	2.60	2.36	2.14	113	2,837	2,950	0.49	10.78	11.27
−12	2.44	2.18	2.03	1.81	109	2,838	2,947	0.48	10.86	11.34
−14	2.07	1.80	1.74	1.51	105	2,838	2,943	0.46	10.95	11.41
−16	1.75	1.51	1.48	1.28	101	2,838	2,939	0.44	11.04	11.48
−18	1.48	1.25	1.26	1.06	97	2,839	2,936	0.43	11.12	11.55
−20	1.24	1.04	1.07	.892	93	2,839	2,932	0.41	11.21	11.62
−22		.854		.738	89	2,839	2,928	0.40	11.30	11.70
−24		.702		.612	85	2,839	2,924	0.38	11.39	11.77
−26		.576		.506	81	2,840	2,921	0.37	11.48	11.85
−28		.468		.414	77	2,840	2,917	0.35	11.58	11.93
−30		.381		.340	74	2,840	2,914	0.34	11.67	12.01
−32		.310		.279	70	2,840	2,910	0.32	11.77	12.09
−34		.250		.227	67	2,839	2,906	0.30	11.87	12.17
−36		.202		.185	63	2,839	2,902	0.29	11.97	12.26
−38		.163		.151	60	2,839	2,899	0.27	12.07	12.34
−40		.131		.122	56	2,839	2,895	0.26	12.17	12.43
−73					0	2,836	2,836	0.0	14.20	14.20

NOTES AND REVIEWS

W. E. KNOWLES-MIDDLETON. **Meteorological Instruments. Toronto (University of Toronto Press), 1941. 213 pp., 160 figs.**

This volume is the first general textbook on its subject in the English language to be published since Cleveland Abbe's *Treatise on Meteorological Apparatus and Methods* in the "Report of the Chief Signal Officer for 1887." The successive chapters cover the instruments commonly used to measure atmospheric pressure, surface temperature (air, soil, and water), humidity, precipitation and evaporation, surface wind (speed and direction), upper-air wind velocity, the motions and heights of clouds and the sizes of cloud or fog droplets, and the duration of sunshine. A concluding chapter is devoted to meteorographs and radiosondes. Numerous references to the literature are included throughout the book.

Charles B. Tuch, the designer of the barometer cistern that bears his name, died in Washington, D. C., on August 1, 1941, at the age of 91, and was buried in Arlington National Cemetery with military honors.

During the early years of the Weather Bureau, first under the Signal Corps (in which he enlisted on April 11, 1879) and later under the Department of Agriculture, Mr. Tuch was engaged in the instrument work of the Bureau, where his faithful and conscientious services were of the greatest value. He became the head instrument maker; and had charge particularly of the repair, calibration, and shipping of mercurial barometers, in which he excelled anyone else. Prior to about 1890, the only *self-recording* instrument at any of the field stations was the Gibbon anemometer register; as barographs, thermographs, and other self-recording instruments were introduced later, their care was also assigned to Mr. Tuch.

The two mercurial barometers with which each station has always been equipped were perhaps the most important of all the instruments at the stations. Mr. Tuch's chief duties were to maintain the readings of these at the highest possible accuracy. At that time the barometers were of the so-called "Fortin" type, having glass and boxwood cisterns with chamois skin bags permitting of the adjustment of the mercury level. The maintenance of these instruments involved not only the cleaning and frequent renewal of the cisterns, but also the fitting of new glass barometer tubes, which had first to be filled with vacuum-distilled mercury of the highest possible purity. Before issue for use, each instrument had to be carefully compared, by readings extending over several days, with the primary standards of the Bureau, and its scale adjusted until the correction for instrumental error was found to be no greater than four thousandths of an inch. The experience gained in this work led to the invention of the so-called Tuch barometer cistern, in which the perishable boxwood chamois skin container for the mercury was replaced by a sturdy metal cylinder with mercury-tight plunger to adjust the level of the mercury to the ivory point for a reading.

Mr. Tuch remained connected with the Weather Bureau until 1916.

METEOROLOGICAL AND CLIMATOLOGICAL DATA FOR NOVEMBER 1941

[Climate and Crop Weather Division, J. B. KINCER in charge]

AEROLOGICAL OBSERVATIONS

By HOMER D. DYCK

Mean surface temperatures for November were from 2° to 4° F. above normal over most of the country with the exception of an area in the central Gulf States which was slightly below normal.

At 1,500 meters above sea level the 5 a. m. resultant winds for November were from directions to the south of normal over most of the country with the exception of Texas and Oklahoma, where they were from directions to north of normal. Although a comparison of the morning resultant winds at 3,000 meters was not possible for the lake region, the Ohio Valley, California, and Nevada, the winds at this level were from directions to the south of normal over most of the rest of the United States with the exception of New Mexico, Oklahoma, and Texas, where resultant winds were to north of normal. At 5,000 meters a good comparison of the 5 p. m. resultant winds with the corresponding 5 a. m. normals was not possible over most of the country. It may be noted, however, that these afternoon winds were from directions to north of normal over California and the southern plateau region and from south of normal over the central Great Plains.

At 1,500 meters resultant wind velocities were above normal over the northern half of the country, west of the Rockies generally and over the central Gulf States, and below normal elsewhere. At 3,000 meters a comparison, of wind velocities, was not possible over the lake region, the Ohio Valley, California, and Nevada, but resultant velocities were below normal generally over the southeast, the southern plateau and extreme northern Montana and above normal elsewhere. At 5,000 meters all stations where a comparison of the 5 p. m. resultant velocities with the corresponding 5 a. m. normals was possible, had above normal velocities. These stations were located over the western half of the country and the central and southern Great Plains.

A correlation between mean surface temperature departures and deviations from normal resultant wind directions is evident. At both 1,500 and 3,000 meters there are areas where a turning to northward of normal took place which have the same general shape as the area where below normal surface temperatures occurred. These areas where the winds turned to northward are, however, displaced somewhat to westward of the area where below-normal temperatures were recorded. The remainder of the country recorded above-normal temperatures and resultant winds to south of normal generally.

When the 5 p. m. resultant directions are compared to the corresponding 5 a. m. resultant directions, a turning to northward during the day is noted at the 1,500 meter level over the lake region, the upper Mississippi Valley, Alabama, Georgia, and South Carolina, while a turning to southward occurred over the rest of the country generally. At the 3,000 meter level no well marked pattern of change was evident; it may be noted, however, that the number of stations where turning to southward during the day occurred was about double the number where the opposite shift occurred.

The 5 p. m. resultant velocities at 1,500 meters were lower than the corresponding 5 a. m. velocities over the Atlantic States, the Ohio Valley, the Gulf States, and the northwest generally and were above the morning velocities

over the rest of the country. At 3,000 meters no comparison was possible over the northern part of the country east of the Mississippi, but elsewhere the afternoon wind velocities were generally higher than the morning velocities with the exception of a few scattered stations.

The upper-air data discussed above are based on 5 a. m. (E. S. T.) pilot balloon observations (charts VIII and IX) as well as on observations made at 5 p. m. (table 2 and charts X and XI).

Radiosonde and airplane stations located in the southern part of the country recorded on the average the highest mean monthly pressures at each of the several standard levels from 2,000 to 17,000 meters. The highest mean monthly pressure occurred over both Brownsville and Miami at standard levels from 2,000 to 6,000 meters, inclusive. From 7,000 to 14,000 meters, inclusive, Miami recorded the highest mean monthly pressures while at 14,000 meters San Antonio also recorded the maximum. The maximum pressures at the 15,000, 16,000, and 17,000 meter levels were recorded over San Antonio. The lowest mean monthly pressure occurred over Sault Ste. Marie at all levels from 2,000 to 17,000 meters, inclusive. At the 15,000 and 16,000 meter levels, Portland, Maine, also recorded minimum pressures.

Mean pressures at the surface and at 1,000 meters were higher this month than in October over the southern Great Plains, California, and the plateau region with the exception of the State of Washington, and below last month at these levels elsewhere. Up to and including the 3,000 meter level, mean pressures for November were higher than during October over the southern plateau region and California and below last month over the remainder of the country. With the exception of Oakland, which recorded pressures higher than the previous month up to 9,000 meters, all other stations recorded pressures lower than those for October for all levels above 3,000 meters. The decreases from the previous month were quite substantial over the eastern half of the United States amounting to as much as 12 or 13 millibars at from 7,000 to 9,000 meters over some stations in the Lake region and the Mississippi Valley. Pressure gradients this month were steeper than last month over the far northwest and over the South and about the same elsewhere. The steepest upper level pressure gradient for November occurred between Sault Ste. Marie and Joliet at the 6,000 and 7,000 meter levels where there was a change of 1 mb. pressure for each 37 miles of horizontal distance between the two stations.

The mean temperatures for November were considerably lower than October's for all stations and all levels up to about 12,000 meters. Above this level temperatures this month were higher than last month's east of the Rocky Mountains generally and below last month's over the remainder of the country.

Mean temperatures for November 1941 were considerably higher than those for November 1940 over most of the United States at nearly all levels with a few scattered exceptions. These exceptions where lower temperatures occurred were over Brownsville, at levels up to 13,000 meters; over Charleston from 3,000 to 19,000 meters inclusive; over Miami from 3,000 to 13,000 meters, and over Portland, Maine, from 5,000 to 11,000 meters.

At 1,000 meters mean temperatures for November were above normal generally. At 3,000 meters they were also above normal, except for California and the Northeast, while at 5,000 meters mean temperatures were below normal generally over the Pacific coast and the central plateau region, the western lake region, the central Great Plains and the Northeast.

The mean relative humidities for the month at the 1,000-meter level were somewhat below normal over the Middle Atlantic States and parts of the South and somewhat above normal elsewhere. At the 3,000- and 5,000- meter levels, humidities were below normal over the Missouri Valley and Oklahoma and above normal generally elsewhere.

The altitude at which the mean monthly temperature of 0° C. for November occurred varied from the lowest (500 meters) over Sault Ste. Marie, to the highest (4,300 meters) over Miami, Fla. The level, at which, on the average, freezing conditions occurred was lower this month than last over all of the United States. This level was much lower than it was last month over the Lake region, being 2,000 meters lower over Sault Ste. Marie, Mich.

The lowest free-air temperature recorded during the month over the United States was −84.0° C. (−119.2° F.). This temperature occurred over Charleston, S. C., on the morning of November 25 at an altitude of 16,000 meters (about 10 miles) above sea level. The lowest temperature for the month over San Juan, P. R., was −87.3° C. (−125.1° F.), observed at 18,100 meters (about 11.2 miles) above sea level on November 24.

Table 3 shows the maximum free-air wind velocities for various sections of the United States during November as determined by pilot-balloon observations. The highest observed wind velocity for the month was 85 m.p.s. (190 miles per hour) observed over Greensboro, N. C., on November 8. This wind was blowing from the south-southwest at an elevation of 7,650 meters (about 4.8 miles) above sea level.

The highest November wind velocity observed during the last 5 years in the free-air layer from the surface to 2,500 meters was 55.8 m.p.s. (125 miles per hour) observed blowing from the west-northwest on November 14, 1938, over Washington, D. C., at an altitude of 2,500 meters (about 1.6 miles). On this same date and over the same station and blowing from the same direction as the maximum wind described above, the maximum wind in the last 5 years for the level from 2,500 to 5,000 meters was recorded. This wind had a velocity of 69.1 m.p.s. (154 miles per hour) and was blowing at an elevation of 2,620 meters (1.6 miles). During the same 5-year period a still higher wind velocity, 98.4 m.p.s. (220 miles per hour) was observed in the layer above 5,000 meters. This wind was blowing from the north at an elevation of 11,120 meters (about 6.9 miles) over Winnemucca, Nev.; on November 22, 1940.

TABLE 1.—*Mean free-air barometric pressure in millibars, temperature in degrees centigrade, and relative humidities in percent, obtained by airplanes and radiosondes during November 1941*

Stations with elevations in meters above sea level

Altitude (meters) m. s. l.	Albuquerque, N. Mex. (1,620 m.)				Atlanta, Ga. (300 m.)				Bismarck, N. Dak. (505 m.)				Boise, Idaho (864 m.)			
	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity
Surface	30	840	8.0	48	30	985	8.9	75	30	955	−1.0	81	28	920	4.2	79
500					30	962	11.2	60								
1,000					30	906	9.7	55	30	898	0.3	76	28	905	6.6	71
1,500					30	853	7.6	54	30	844	0.4	65	28	852	5.9	61
2,000	30	802	8.5	47	30	802	5.7	46	30	793	−0.6	60	28	801	3.4	59
2,500	30	755	5.7	46	30	755	3.8	38	30	745	−2.8	56	28	753	0.7	59
3,000	30	710	2.6	47	30	709	1.4	37	30	699	−5.3	54	28	707	−2.6	60
4,000	30	626	−3.3	45	30	626	−3.5	33	30	614	−11.3	53	28	623	−8.4	58
5,000	29	552	−9.4	37	30	551	−9.6	29	30	539	−17.6	51	27	547	−14.7	58
6,000	29	484	−16.1	33	30	483	−15.9	29	30	470	−24.3	49	27	478	−21.6	58
7,000	29	423	−22.9	32	29	423	−22.6	30	30	409	−31.1	48	27	417	−28.5	54
8,000	29	368	−30.1	31	29	368	−29.4	30	30	355	−38.3	48	26	362	−35.8	52
9,000	29	320	−37.1	28	29	319	−36.2	29	29	306	−45.0		26	312	−43.1	
10,000	29	276	−43.8		29	276	−42.4		29	263	−50.5		25	269	−49.8	
11,000	29	238	−49.6		29	238	−47.8		29	225	−54.5		25	231	−54.1	
12,000	29	203	−54.2		29	204	−53.0		28	193	−56.5		24	197	−56.0	
13,000	29	174	−58.2		29	174	−57.6		28	164	−56.9		24	169	−57.1	
14,000	29	148	−60.7		29	149	−61.1		27	140	−56.8		23	144	−58.7	
15,000	27	126	−63.1		26	126	−63.6		27	120	−56.8		23	123	−59.8	
16,000	20	107	−64.8		25	108	−65.4		23	102	−57.5		20	104	−61.2	
17,000	15	91	−65.0		24	91	−66.3		16	87	−58.7		16	89	−61.5	
18,000	6	77	−64.3		21	77	−65.9		6	74	−58.9		11	75	−60.4	
19,000					13	65	−64.8									
20,000					8	55	−63.6									

Altitude (meters) m. s. l.	Brownsville, Tex. (6 m.)				Buffalo, N. Y. (221 m.)				Charleston, S. C. (14 m.)			
	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity
Surface	30	1,018	17.8	87	29	989	5.7	72	30	1,018	11.2	90
500	30	961	17.4	75	29	956	5.4	72	30	961	14.0	63
1,000	30	906	14.8	72	29	899	2.6	73	30	906	11.4	57
1,500	30	854	12.8	68	29	845	0.5	69	30	853	9.5	53
2,000	30	805	11.4	61	29	794	−1.3	68	30	803	7.4	48
2,500	30	758	9.8	55	29	745	−4.0	66	30	756	5.4	42
3,000	30	714	7.4	51	29	699	−5.9	59	30	710	2.9	42
4,000	30	631	1.1	52	28	615	−10.6	53	30	628	−1.9	43
5,000	30	557	−4.6	48	26	539	−16.2	48	29	552	−8.0	40
6,000	29	490	−11.2	45	25	471	−22.6	45	29	485	−14.7	38
7,000	29	429	−18.0	41	25	410	−29.1	43	28	424	−21.8	37
8,000	29	375	−25.1	39	23	356	−35.9	41	28	370	−29.1	37
9,000	26	325	−32.8	38	21	308	−42.4		28	320	−36.5	37
10,000	26	282	−40.5		18	265	−48.1		27	277	−44.0	
11,000	26	243	−47.5		17	227	−51.6		27	238	−50.5	
12,000	24	208	−53.9		15	195	−54.0		27	204	−56.1	
13,000	23	178	−59.4		14	166	−55.4		25	173	−60.9	
14,000	22	151	−64.7		12	142	−56.5		24	147	−65.3	
15,000	21	128	−69.6		10	122	−57.5		23	125	−68.6	
16,000	20	108	−72.5		8	104	−58.2		21	105	−71.1	
17,000	13	92	−74.5		6	90	−58.2		20	89	−72.0	
18,000	8	77	−71.9						12	75	−71.3	
19,000									7	63	−70.1	
20,000												

Stations with elevations in meters above sea level

Altitude (meters) m. s. l.	Denver, Colo. (1,616 m.)				Detroit, Mich. (194 m.)				El Paso, Tex. (1,193 m.)				Ely, Nev. (1,908 m.)			
	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity
Surface	28	839	1.8	65	30	991	3.7	83	25	884	9.7	67	30	812	−1.5	77
500					30	955	4.5	76								
1,000					30	898	3.0	71								
1,500					30	844	1.2	64	25	853	11.8	57				
2,000	28	800	6.4	49	30	793	−0.2	56	25	803	9.2	55	30	803	1.9	71
2,500	28	753	3.6	43	30	745	−2.2	52	25	756	6.5	54	30	755	2.4	63
3,000	28	707	0.1	41	30	699	−4.6	51	25	711	3.7	53	30	709	−0.1	59
4,000	28	624	−7.2	41	29	615	−10.1	48	25	628	−1.8	48	29	625	−6.0	57
5,000	27	548	−13.5	41	29	540	−15.8	44	25	553	−8.1	43	29	550	−12.1	53
6,000	25	479	−20.1	39	29	472	−22.3	43	24	485	−14.1	39	28	481	−19.2	51
7,000	24	418	−26.9	37	29	411	−29.0	42	23	425	−20.7	38	28	420	−26.2	51
8,000	23	363	−34.2	37	28	357	−35.9	42	23	371	−28.2	37	28	365	−33.3	50
9,000	20	314	−40.9		28	308	−42.9		23	321	−35.5	36	27	315	−40.0	48
10,000	20	271	−46.9		28	265	−48.4		23	278	−42.1		27	272	−46.7	
11,000	17	232	−52.1		28	228	−52.4		23	239	−50.1		27	234	−52.6	
12,000	16	199	−54.9		28	195	−54.8		23	204	−56.2		27	200	−55.9	
13,000	16	170	−57.3		26	166	−56.0		23	174	−59.8		27	170	−58.8	
14,000	14	145	−58.5		26	142	−56.8		23	148	−62.2		25	145	−60.3	
15,000	10	124	−59.7		24	121	−58.3		22	126	−65.3		22	124	−62.4	
16,000	9	106	−60.9		19	103	−59.0		18	107	−66.8		19	105	−64.5	
17,000					14	88	−59.0		15	91	−67.9		10	89	−65.2	
18,000					10	75	−59.1		9	76	−68.3					
19,000					6	64	−58.9		6	65	−66.2					

Altitude (meters) m. s. l.	Great Falls, Mont. (1,128 m.)				Huntington, W. Va. (172 m.)				Joliet, Ill. (178 m.)			
	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity
Surface	29	886	3.9	59	30	999	3.8	85	30	995	4.0	88
500					30	960	7.8	65	30	956	5.3	82
1,000					30	903	5.8	60	30	900	3.5	78
1,500	29	848	4.8	55	30	850	3.4	56	30	846	1.8	72
2,000	29	796	1.9	53	30	798	1.6	53	30	794	0.4	67
2,500	29	748	−1.4	53	30	750	−0.3	50	30	747	−1.2	63
3,000	29	702	−4.3	51	30	705	−2.3	46	30	700	−3.6	61
4,000	29	618	−10.6	48	29	621	−7.3	40	30	616	−8.9	57
5,000	29	542	−17.0	46	29	545	−13.2	34	30	541	−14.8	55
6,000	29	473	−23.8	45	28	477	−19.9	33	30	474	−21.2	52
7,000	29	412	−31.0	44	28	416	−26.7	32	30	413	−28.1	50
8,000	28	357	−38.3	42	27	362	−33.5	31	30	358	−35.6	48
9,000	28	308	−45.3		27	313	−39.9		28	309	−42.8	
10,000	28	264	−51.1		27	270	−45.6		28	266	−48.8	
11,000	27	227	−54.4		27	232	−50.2		26	228	−52.8	
12,000	25	194	−55.6		26	199	−53.8		26	195	−54.6	
13,000	22	165	−56.1		26	170	−56.6		25	167	−56.0	
14,000	20	141	−56.6		23	145	−58.5		23	142	−56.7	
15,000	17	120	−57.2		21	123	−60.4		20	121	−57.7	
16,000	11	102	−59.0		18	105	−61.7		10	103	−58.5	
17,000	6	86	−60.0		15	89	−62.2		8	88	−59.7	
18,000					7	75	−61.7					
19,000												

TABLE 1.—*Mean free-air barometric pressure in millibars, temperature in degrees centigrade, and relative humidities in percent, obtained by airplanes and radiosondes during November 1941*—Continued

Altitude (meters) m. s. l.	Stations with elevations in meters above sea level																											
	Lake Charles, La. (5 m.)				Lakehurst, N. J.[1] (39 m.)				Medford, Oreg. (401 m.)				Miami, Fla. (4 m.)				Nashville, Tenn. (180 m.)				Norfolk, Va.[1, 2] (10 m.)				Oakland, Calif. (2 m.)			
	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity
Surface	30	1,020	11.0	88	29	1,014	6.4	69	30	970	8.1	86	30	1,016	20.6	90	29	999	6.8	79	27	1,020	9.0	80	30	1,018	12.2	83
500	30	962	12.7	67	29	959	6.9	51	30	959	9.5	81	30	960	19.8	88	29	961	9.3	65	27	960	10.7	62	30	960	14.0	69
1,000	30	906	11.3	58	29	903	4.4	49	30	903	9.6	67	30	906	16.5	88	29	905	7.1	58	27	904	8.6	57	30	905	12.9	56
1,500	30	853	9.7	52	29	849	2.3	51	30	850	7.8	63	30	854	13.7	85	29	851	5.5	53	26	851	7.3	49	30	852	10.8	50
2,000	29	803	8.3	43	29	797	0.4	49	30	800	5.2	60	30	805	11.7	75	29	800	3.6	48	26	801	5.5	44	30	802	8.4	47
2,500	29	756	6.5	39	29	749	−1.5	49	30	752	2.2	57	30	758	9.3	65	28	752	1.5	41	26	753	3.2	39	30	755	5.6	45
3,000	28	711	4.1	39	29	703	−3.4	46	30	706	−0.8	51	30	714	7.1	60	28	707	−0.6	38	26	707	0.7	37	30	710	2.8	41
4,000	28	628	−1.7	39	29	618	−8.9	44	30	622	−6.9	46	30	631	2.1	46	27	623	−5.4	33	24	623	−5.0	34	30	626	−3.2	37
5,000	28	553	−7.4	35	29	542	−14.4	38	30	547	−13.8	44	30	557	−4.2	42	27	548	−11.3	30	16	548	−11.0	31	30	552	−9.5	33
6,000	28	486	−13.7	34	29	474	−21.1	37	30	479	−20.5	44	29	490	−10.2	39	27	480	−17.7	27					30	484	−15.9	32
7,000	27	425	−20.9	36	29	414	−27.9	45	30	417	−27.5	43	29	430	−17.0	39	26	419	−24.9	26					30	423	−22.8	31
8,000	27	370	−27.8	36	28	360	−34.5		30	363	−34.8	42	29	376	−24.1	38	24	364	−31.9	26					28	369	−29.8	31
9,000	27	321	−34.9	36	27	311	−40.9		30	314	−42.0		29	326	−31.3	38	23	315	−38.8						28	319	−37.0	31
10,000	27	278	−41.5		27	268	−47.1		30	270	−48.7		29	283	−39.3	38	21	272	−44.7						27	276	−43.7	
11,000	27	240	−48.0		26	230	−52.6		30	232	−54.0		29	244	−47.1		21	234	−49.5						25	237	−50.3	
12,000	27	206	−53.8		24	197	−57.0		30	198	−57.4		27	209	−54.6		20	200	−54.1						22	203	−55.8	
13,000	27	176	−58.3		23	168	−59.6		27	168	−59.1		26	179	−61.4		18	171	−56.8						21	174	−58.9	
14,000	26	149	−61.7		22	143	−61.0		26	144	−60.0		25	152	−67.2		18	145	−59.1						17	148	−60.2	
15,000	23	127	−64.4		17	122	−62.3		24	122	−61.4		24	128	−71.2		16	124	−61.0						15	126	−60.9	
16,000	22	108	−66.8		12	103	−62.7		21	104	−62.9		24	109	−74.0		14	105	−62.8						14	107	−62.1	
17,000	20	92	−68.7		8	87	−63.4		13	88	−63.5		18	91	−74.4		14	89	−63.8						12	91	−62.6	
18,000	12	77	−69.2		6	74	−64.4		6	74	−63.3		10	77	−70.6		12	75	−63.5						11	78	−62.9	
19,000													6	65	−67.0		7	63	−63.1									

Altitude (meters) m. s. l.	Stations with elevations in meters above sea level																											
	Oklahoma City, Okla. (391 m.)				Omaha, Nebr. (301 m.)				Phoenix, Ariz. (339 m.)				Portland, Maine (20 m.)				St. Louis, Mo. (171 m.)				St. Paul, Minn. (225 m.)				San Antonio, Tex. (174 m.)			
	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity
Surface	30	974	8.5	80	30	982	3.6	82	30	975	13.0	64	30	1,013	2.7	77	30	998	6.7	76	29	988	2.2	77	30	1,000	13.3	81
500	30	961	9.7	70	30	958	5.3	72	30	957	18.2	44	30	955	3.2	71	30	959	7.8	67	29	955	2.0	74	30	962	15.6	66
1,000	30	905	9.1	59	30	901	4.9	64	30	903	17.2	35	30	898	0.9	69	30	902	6.1	63	29	898	0.5	70	30	907	13.3	66
1,500	30	852	7.8	53	30	847	4.0	57	30	851	14.2	34	30	843	−0.9	68	30	849	4.5	60	29	843	−0.1	61	30	855	11.5	68
2,000	30	802	6.1	52	29	796	2.1	51	30	802	10.7	34	30	792	−2.7	64	30	798	2.5	53	29	792	−1.6	53	30	804	10.1	56
2,500	30	754	3.8	47	29	748	−0.1	47	30	754	7.5	35	30	743	−4.9	63	29	750	0.7	51	28	744	−3.4	45	30	758	7.8	51
3,000	30	709	1.1	43	29	703	−2.5	42	30	710	4.5	35	30	697	−7.1	62	29	704	−2.0	50	28	698	−5.6	41	30	713	5.4	48
4,000	30	625	−3.9	36	28	619	−8.4	38	29	627	−1.0	29	30	613	−12.2	56	28	620	−7.4	49	26	613	−11.2	37	30	630	−0.2	46
5,000	30	550	−10.2	33	27	544	−14.7	35	29	553	−7.0	27	30	537	−18.3	52	27	545	−13.1	46	25	538	−17.7	37	29	556	−5.6	40
6,000	29	482	−16.8	31	27	476	−21.4	34	29	486	−13.5	27	28	469	−24.8	51	27	477	−19.7	44	25	470	−24.1	36	28	488	−11.9	38
7,000	28	422	−23.6	29	26	414	−28.9	33	29	425	−20.2	27	28	408	−31.5	51	27	416	−26.8	41	25	409	−31.0	35	27	428	−18.5	35
8,000	28	367	−30.7	28	26	360	−36.3	33	29	370	−27.0	27	27	353	−38.7	51	26	361	−34.1	41	25	355	−38.2	35	26	373	−25.3	35
9,000	27	318	−37.2	28	26	311	−42.9		29	322	−34.1	27	27	305	−45.3		26	312	−41.2		25	306	−45.1		26	324	−32.3	34
10,000	26	275	−43.7		26	268	−48.1		28	279	−41.0		27	262	−50.8		25	269	−46.4		25	263	−50.4		26	281	−39.7	33
11,000	23	236	−49.4		23	230	−51.5		28	240	−47.6		26	224	−55.4		25	232	−50.8		25	226	−53.0		25	242	−46.4	
12,000	22	202	−55.3		22	197	−53.6		27	206	−53.0		25	192	−58.6		24	198	−53.8		25	194	−53.9		25	208	−52.4	
13,000	21	172	−58.3		20	168	−55.4		27	176	−57.9		25	163	−59.8		24	169	−55.6		20	165	−54.6		24	178	−57.1	
14,000	20	147	−60.2		17	143	−56.9		26	150	−60.4		22	139	−60.6		22	144	−57.4		19	141	−54.5		23	152	−60.2	
15,000	18	124	−61.5		12	122	−57.6		25	128	−61.6		16	118	−61.8		22	123	−58.6		18	121	−55.7		22	129	−63.2	
16,000	18	106	−62.7						25	109	−63.8		11	101	−63.2		20	105	−60.3		13	103	−56.6		22	110	−66.0	
17,000	16	90	−63.6						21	92	−65.5						13	90	−61.4		10	88	−57.4		19	93	−67.9	
18,000	14	76	−63.8						14	78	−64.3						6	76	−62.0						13	78	−68.3	
19,000	9	64	−62.6						6	66	−62.8														10	66	−67.1	
20,000									5	56	−61.3														5	56	−65.2	

TABLE 1.—*Mean free-air barometric pressure in millibars, temperature in degrees centigrade, and relative humidities in percent, obtained by airplanes and radiosondes during November 1941*—Continued

Stations with elevations in meters above sea level

Altitude (meters) m. s. l.	San Diego, Calif.[1] (19 m.)				Sault Ste. Marie, Mich. (221 m)				Seattle, Wash.[1] (27 m.)				Spokane, Wash. (598 m.)				Washington, D. C. (25 m.)				Anchorage, Alaska (42 m.)				Barrow, Alaska (6 m.)			
	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity
Surface	27	1,013	16.5	81	30	985	1.5	82	30	1,014	8.9	87	30	948	3.6	88	30	1,016	9.0	64	30	999	−6.2	73	30	1,014	−19.6	91
500	27	957	16.7	60	30	952	0.0	82	30	958	7.8	75	----	----	----	----	30	960	9.5	55	29	943	−6.0	68	30	950	−15.3	88
1,000	27	902	14.5	48	30	894	−2.4	82	30	902	5.3	72	30	902	4.8	78	30	904	6.8	53	29	884	−7.1	65	30	889	−15.6	83
1,500	27	850	11.9	41	30	839	−4.2	82	30	848	2.6	72	30	848	2.7	71	30	850	4.8	50	29	829	−9.1	63	30	832	−17.0	80
2,000	27	801	9.4	35	30	788	−4.9	72	30	797	0.1	65	30	797	0.2	67	30	799	2.8	49	29	777	−11.6	60	30	778	−19.2	78
2,500	27	753	6.7	31	30	739	−6.5	69	30	748	−2.2	60	29	749	−2.4	65	30	751	0.9	48	29	727	−14.2	57	30	727	−21.8	77
3,000	27	708	3.7	27	30	692	−9.1	68	30	702	−4.7	58	29	703	−5.0	62	30	705	−1.3	45	29	681	−17.3	55	30	679	−24.1	75
4,000	27	626	−1.7	26	30	608	−14.6	68	30	618	−10.8	59	29	618	−10.7	55	30	621	−6.7	41	29	595	−23.9	53	30	591	−29.6	72
5,000	27	551	−7.6	26	29	532	−20.8	66	30	542	−17.4	64	28	542	−17.4	54	29	546	−12.2	37	27	518	−30.3	52	30	513	−35.9	70
6,000	26	484	−14.2	34	27	464	−27.4	64	30	473	−24.3	64	27	474	−24.5	54	27	478	−18.9	35	27	449	−36.9	50	30	444	−42.5	----
7,000	25	424	−21.4	37	26	403	−34.1	60	30	412	−31.4	66	27	412	−31.5	56	25	418	−25.8	35	27	388	−42.9	----	30	382	−48.6	----
8,000	21	369	−28.8	----	26	349	−40.9	----	29	357	−38.5	68	27	357	−38.6	56	24	363	−32.8	34	26	334	−47.9	----	30	327	−53.3	----
9,000	21	320	−35.9	----	25	300	−45.2	----	28	308	−45.3	----	27	308	−45.9	----	23	314	−39.6	34	25	287	−51.5	----	29	280	−55.6	----
10,000	20	277	−42.7	----	25	258	−49.6	----	27	265	−50.9	----	24	264	−51.8	----	23	271	−46.0	----	25	246	−52.9	----	29	239	−54.9	----
11,000	17	238	−48.9	----	25	222	−52.4	----	26	227	−55.1	----	23	227	−54.6	----	23	233	−51.7	----	24	210	−52.6	----	27	205	−53.3	----
12,000	15	204	−54.8	----	20	190	−53.0	----	25	194	−56.3	----	22	194	−55.4	----	23	199	−56.6	----	23	180	−51.4	----	27	175	−52.1	----
13,000	14	175	−58.7	----	20	162	−53.3	----	23	166	−56.7	----	18	166	−56.0	----	22	170	−59.6	----	20	154	−50.8	----	25	150	−51.7	----
14,000	12	149	−61.8	----	15	138	−54.3	----	21	142	−57.8	----	18	141	−57.8	----	19	144	−61.2	----	15	132	−50.3	----	21	128	−51.7	----
15,000	8	126	−65.3	----	11	118	−54.4	----	18	121	−59.3	----	17	120	−58.6	----	19	122	−62.6	----	13	113	−49.9	----	15	110	−51.5	----
16,000	7	107	−68.6	----	10	101	−55.2	----	14	103	−59.8	----	14	103	−58.9	----	17	104	−64.1	----	7	97	−49.9	----	10	94	−51.9	----
17,000	----	----	----	----	7	86	−55.3	----	7	87	−60.0	----	6	88	−59.4	----	15	88	−64.9	----	----	----	----	----	----	----	----	----
18,000	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	6	75	−65.1	----	----	----	----	----	----	----	----	----

Stations with elevations in meters above sea level

Altitude (meters) m. s. l.	Bethel, Alaska (7 m.)				Coco Solo, C. Z.[1] [2] (15 m.)				Fairbanks, Alaska (156 m.)				Juneau, Alaska (49 m.)				Ketchikan, Alaska (26 m.)				Nome, Alaska (14 m.)				San Juan, P. R. (15 m.)			
	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity
Surface	24	1,009	−9.1	77	19	1,012	26.3	89	30	992	−15.8	81	29	1,000	2.0	76	28	1,004	5.5	83	30	1,009	−7.2	79	30	1,012	24.8	89
500	24	948	−6.4	71	19	957	24.4	87	30	949	−14.2	83	29	946	−0.8	76	28	948	3.3	84	30	948	−7.5	80	30	958	22.4	89
1,000	24	889	−8.2	66	19	903	21.2	87	30	888	−14.2	80	28	888	−3.8	79	28	891	0.2	84	30	889	−10.2	77	30	905	19.5	86
1,500	24	833	−10.1	62	19	853	18.1	76	30	831	−14.8	78	27	833	−6.2	80	27	837	−2.7	82	30	832	−12.2	72	30	854	16.7	85
2,000	24	780	−12.0	55	19	804	15.3	73	30	778	−16.2	77	27	781	−8.2	80	27	786	−5.3	79	30	780	−13.7	66	30	805	14.3	83
2,500	24	731	−13.7	48	19	758	12.8	63	30	728	−18.0	73	27	732	−11.0	79	27	737	−7.9	73	30	730	−16.1	62	30	758	12.2	73
3,000	24	684	−16.4	45	19	713	10.1	50	30	680	−20.4	69	27	686	−13.7	75	27	690	−10.6	68	30	683	−18.6	59	30	714	10.0	64
4,000	24	598	−22.4	43	10	632	3.7	38	29	594	−26.0	65	24	600	−19.6	63	25	605	−16.7	62	27	596	−24.3	55	30	633	4.5	60
5,000	24	521	−28.3	41	----	----	----	----	28	516	−32.0	63	23	523	−25.7	59	21	529	−23.4	59	26	520	−30.2	54	29	559	−1.1	55
6,000	24	452	−34.8	42	----	----	----	----	28	448	−38.3	61	20	454	−31.9	55	20	460	−29.6	57	22	451	−36.7	53	29	493	−7.0	53
7,000	23	391	−40.9	42	----	----	----	----	27	386	−44.6	----	19	393	−38.9	52	18	399	−36.2	57	21	386	−42.9	----	29	433	−13.5	45
8,000	22	337	−46.9	----	----	----	----	----	24	332	−49.6	----	16	338	−45.3	----	16	344	−43.0	----	17	336	−48.3	----	29	379	−20.4	44
9,000	22	289	−51.5	----	----	----	----	----	22	285	−52.6	----	12	290	−50.1	----	16	296	−48.7	----	17	288	−51.8	----	29	330	−27.6	40
10,000	22	248	−53.2	----	----	----	----	----	20	244	−53.8	----	12	248	−53.3	----	14	254	−51.7	----	13	248	−53.1	----	28	287	−34.6	38
11,000	22	212	−53.7	----	----	----	----	----	18	209	−52.9	----	11	212	−54.3	----	12	218	−52.1	----	13	212	−53.8	----	28	248	−41.7	----
12,000	20	182	−52.2	----	----	----	----	----	17	179	−51.5	----	11	181	−53.1	----	11	186	−50.7	----	12	182	−52.8	----	25	214	−48.7	----
13,000	18	156	−50.5	----	----	----	----	----	16	154	−50.6	----	8	155	−52.5	----	11	159	−50.6	----	11	156	−51.3	----	25	183	−56.0	----
14,000	17	134	−49.5	----	----	----	----	----	11	132	−50.2	----	8	133	−52.3	----	9	136	−50.8	----	9	134	−50.5	----	25	156	−63.4	----
15,000	12	114	−48.9	----	----	----	----	----	6	114	−50.0	----	5	113	−52.0	----	7	116	−51.3	----	9	116	−49.5	----	24	132	−69.9	----
16,000	5	98	−49.1	----	----	----	----	----	5	97	−49.6	----	----	----	----	----	----	----	----	----	7	100	−49.1	----	23	112	−74.8	----
17,000	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----					6	86	−49.6	----	22	94	−78.2	----
18,000	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	20	78	−77.8	----
19,000	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	19	66	−74.6	----
20,000	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	16	56	−69.8	----
21,000	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	7	47	−65.0	----

NOTES FOR TABLE I

All observations taken at 11 p. m., 75th meridian time, except at Lakehurst, N. J., where they are taken near 5 a. m., at Norfolk, Va., at about 6 a. m., at Coco Solo, C. Z., at about 7 a. m., at St. Thomas, V. I., at about 8 a. m., and at Pearl Harbor, T. H., at about 7 a. m., E. S. T.

Number of observations refers to pressure only as temperature and humidity data are missing for some observations at certain levels also, the humidity data are not used in daily observations when the temperature is below −40.0°.

None of the means included in this table are based on less than 15 surface or 5 standard level observations.

[1] U. S. Navy.

[2] Airplane observations.

LATE REPORTS

Altitude (meters) m. s. l.	October 1941							
	Barrow, Alaska (6 m.)				Pearl Harbor, T. H. (7 m.)			
	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity
Surface	31	1,011	−10.5	92	27	1,014	24.1	78
500	31	949	−8.6	87	27	958	20.6	84
1,000	31	889	−8.8	79	27	904	17.3	89
1,500	31	833	−10.4	76	27	853	14.7	86
2,000	31	781	−13.1	74	27	804	12.4	77
2,500	31	731	−15.6	73	27	757	10.7	56
3,000	31	684	−18.2	72	27	713	9.0	41
4,000	31	597	−23.8	68	26	631	3.8	32
5,000	30	520	−29.6	64	26	557	−2.1	27
6,000	29	451	−36.4	61	25	490	−8.8	28
7,000	28	389	−43.4		24	430	−15.0	39
8,000	28	334	−49.5		24	376	−21.8	42
9,000	28	287	−53.9		24	327	−29.0	43
10,000	28	245	−53.5		24	285	−37.0	
11,000	28	210	−51.0		22	246	−45.3	
12,000	28	180	−50.3		21	211	−54.0	
13,000	27	154	−50.3		19	180	−61.9	
14,000	27	132	−50.5		17	153	−68.8	
15,000	24	114	−50.6		13	129	−74.4	
16,000	19	97	−51.4		10	109	−79.1	
17,000	15	84	−52.1		8	91	−79.2	
18,000	6	72	−52.7		6	76	−78.1	
19,000								
20,000								

Altitude (meters) m. s. l.	October 1941				September 1941			
	Swan Island, W. I. (10m.)				Barrow, Alaska (6m.)			
	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity
Surface	31	1,012	27.1	83	31	1,017	0.0	86
500	30	958	24.2	90	31	956	0.2	79
1,000	30	905	21.4	84	31	898	−0.4	69
1,500	30	854	18.8	76	31	844	−1.8	63
2,000	31	805	16.2	73	31	792	−3.6	60
2,500	31	759	13.7	70	31	743	−5.8	56
3,000	31	715	11.2	65	31	697	−8.4	54
4,000	31	634	6.0	61	31	612	−14.3	52
5,000	31	561	1.0	56	30	536	−20.9	50
6,000	30	494	−4.5	52	30	467	−28.0	49
7,000	30	435	−10.3	51	29	405	−35.2	49
8,000	30	381	−16.6	47	29	350	−42.4	
9,000	30	333	−23.5	45	29	301	−49.0	
10,000	30	290	−30.7	44	29	258	−53.6	
11,000	30	251	−38.4	43	29	222	−53.1	
12,000	30	217	−46.4		29	190	−51.0	
13,000	26	186	−54.4		29	162	−49.7	
14,000	24	159	−62.3		29	139	−49.5	
15,000	23	135	−70.0		29	119	−49.5	
16,000	23	114	−76.8		28	102	−49.5	
17,000	20	95	−81.2		23	88	−49.8	
18,000	18	80	−82.8		15	75	−50.1	
19,000	11	67	−78.7		5	65	−50.6	
20,000	6	56	−72.9					

TABLE 2.—*Free-air resultant winds based on pilot balloon observations made near 5 p. m. (75th meridian time) during November 1941. Directions given in degrees from North (N=360°, E=90°, S=180°, W=270°)—Velocities in meters per second*

Altitude (meters) m. s. l.	Abilene, Tex. (537 m.)			Albuquerque N. Mex. (1,630 m.)			Atlanta, Ga. (299 m.)			Billings, Mont. (1,095 m.)			Bismarck, N. Dak. (512 m.)		
	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity
Surface	30	228	2.2	29	215	0.9	28	318	0.9	28	256	3.8	29	297	3.6
500							28	326	1.2						
1,000	30	226	2.9				28	282	0.9				29	306	5.7
1,500	29	237	4.7				26	304	1.6	28	262	8.6	22	293	9.5
2,000	29	253	5.8	29	241	1.7	24	284	3.1	28	282	9.3	19	292	10.5
2,500	25	277	7.0	29	285	3.2	24	283	5.2	27	284	9.6	19	293	12.9
3,000	25	277	7.8	29	299	5.3	24	276	7.0	26	285	12.5	18	289	15.1
4,000	24	281	9.8	28	300	8.8	22	270	9.3	24	295	13.3	17	292	19.0
5,000	23	285	11.9	27	298	10.9	20	280	12.0	18	297	15.3	17	293	19.8
6,000	23	285	14.9	25	298	11.5	18	274	14.1				15	292	21.6
8,000	16	287	21.9	22	289	15.3	15	279	13.4				13	305	23.7
10,000	11	298	25.0	18	289	19.7	10	277	13.8						
12,000	10	285	21.2	11	295	18.9									

Altitude (meters) m. s. l.	Boise, Idaho (866 m.)			Brownsville, Tex. (7 m.)			Buffalo, N. Y. (220 m.)			Burlington, Vt. (132 m.)		
	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity
Surface	30	319	0.6	29	70	2.9	27	242	6.3	28	208	1.6
500				29	75	3.3	27	245	9.9	28	229	5.9
1,000	30	166	0.1	24	106	1.8	25	247	13.7	26	250	8.2
1,500	30	209	1.2	22	177	1.2	22	261	13.6	22	266	9.9
2,000	30	254	3.4	19	238	2.2	19	265	15.5	15	276	12.0
2,500	26	268	5.5	17	267	3.1	15	269	15.9			
3,000	24	275	7.8	14	283	5.0	11	272	18.9			
4,000	21	271	9.9	13	286	8.3						
5,000	18	269	10.9	11	249	8.9						
6,000	15	278	12.0	10	289	11.6						
8,000												
10,000												
12,000												

Altitude (meters) m. s. l.	Charleston, S. C. (17 m.)			Chicago, Ill. (192 m.)			Cincinnati, Ohio (152 m.)			Denver, Colo. (1,627 m.)		
	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity
Surface	30	9	0.5	28	248	3.8	30	231	2.2	29	266	1.1
500	30	1	0.8	28	242	6.6	30	232	5.2			
1,000	29	280	1.5	24	250	11.0	28	242	7.2			
1,500	27	272	3.1	21	260	12.1	26	256	9.4			
2,000	27	265	5.1	18	264	13.4	23	261	10.1	29	296	2.1
2,500	24	257	7.4	16	271	15.1	19	274	11.7	29	301	3.1
3,000	24	258	9.2	16	270	16.0	18	278	12.0	28	296	5.7
4,000	22	248	12.2	13	271	15.2	14	280	14.3	27	310	8.9
5,000	16	251	13.4	13	275	17.8				27	308	9.8
6,000	15	249	16.0	13	281	19.3				24	312	12.0
8,000				12	282	23.7				22	304	14.3
10,000										16	310	19.4
12,000										11	297	20.2

Altitude (meters) m. s. l.	El Paso, Tex. (1,196 m.)			Ely, Nev. (1,910 m.)			Grand Junction, Colo. (1,413 m.)			Greensboro, N. C. (271 m.)			Havre, Mont. (767 m.)		
	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity
Surface	30	315	1.2	29	305	0.4	30	280	1.0	29	230	1.9	28	260	3.1
500										29	234	3.1			
1,000										29	245	4.1	28	255	7.7
1,500	30	287	1.6							29	261	4.6	28	268	12.5
2,000	30	259	1.9	29	270	0.4	30	284	1.4	29	270	6.5	28	276	12.8
2,500	29	270	3.8	29	254	1.0	30	253	1.9	27	266	7.5	26	279	12.8
3,000	27	283	5.9	29	252	1.3	30	267	3.3	27	263	10.0	20	283	13.4
4,000	26	284	7.4	25	276	4.2	29	308	5.6	25	261	11.8	13	296	13.5
5,000	24	282	9.8	24	288	7.3	25	326	9.6	25	259	15.2	12	292	14.3
6,000	23	285	10.8	23	303	9.1	20	320	10.6	23	265	18.3			
8,000	21	296	16.1	21	299	12.4				19	272	20.8			
10,000	21	289	19.3	19	321	11.8				15	274	23.4			
12,000	17	308	20.8							10	276	25.4			
14,000	14	306	19.2												

Altitude (meters) m. s. l.	Jacksonville, Fla. (14 m.)			Las Vegas, Nev. (570 m.)			Little Rock, Ark. (79 m.)			Medford, Oreg. (410 m.)		
	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity
Surface	28	16	2.1	30	30	1.1	29	216	0.9	27	176	0.3
500	28	32	1.5				29	219	2.0	27	169	0.4
1,000	28	300	0.7	30	19	2.7	27	237	3.4	27	144	2.0
1,500	28	257	2.7	30	24	2.5	26	266	5.3	27	192	2.7
2,000	25	263	5.4	30	339	1.0	26	273	6.2	25	213	3.9
2,500	25	263	7.0	30	316	1.4	23	274	6.2	23	233	4.2
3,000	24	250	8.5	30	305	2.5	23	271	7.5	22	250	4.5
4,000	22	255	11.4	29	293	4.2	17	270	6.8	21	278	5.9
5,000	19	258	11.9	28	302	6.2	15	295	7.7	20	281	7.4
6,000	20	260	14.5	28	301	9.1	13	296	7.3	18	301	11.4
8,000	14	261	19.7	24	296	12.7				14	316	16.3
10,000				23	294	18.8				12	305	19.0
12,000				19	302	21.3						
14,000				16	302	20.7						
				15	290	15.7						

Altitude (meters) m. s. l.	Miami, Fla. (10 m.)			Minneapolis, Minn. (265 m.)			Mobile, Ala. (8 m.)			Nashville, Tenn. (194 m.)		
	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity
Surface	29	56	2.4	29	278	2.1	30	35	0.8	28	242	0.8
500	29	71	3.9	29	273	3.5	30	27	2.0	28	220	1.9
1,000	29	70	2.5	26	272	6.3	29	19	1.7	27	242	3.4
1,500	25	203	0.3	23	275	10.5	28	311	1.7	25	241	4.8
2,000	21	229	2.5	18	275	13.6	26	276	5.2	23	262	6.1
2,500	17	224	4.8	17	277	14.3	24	272	5.7	21	263	6.5
3,000	17	236	4.7	16	280	15.8	21	272	6.4	21	264	7.5
4,000	13	244	6.1	16	283	19.3	18	272	8.5	17	272	11.4
5,000	14	244	6.9	14	286	24.3	14	274	11.1	13	272	13.2
6,000	14	247	9.0	10	288	28.4				12	277	15.7
8,000	12	267	14.3									
10,000												
12,000												
14,000												

TABLE 2.—*Free-air resultant winds based on pilot balloon observations made near 5 p. m. (75th meridian time) during November 1941. Directions given in degrees from North (N=360°, E=90°, S=180°, W=270°)—Velocities in meters per second*—Continued

Altitude (meters) m. s. l.	New York, N. Y. (15 m.)			Oakland, Calif. (8 m.)			Oklahoma City, Okla. (402 m.)			Omaha, Nebr. (306 m.)			Phoenix, Ariz. (338 m.)		
	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity
Surface	28	271	4.0	27	253	1.7	29	227	2.5	27	231	2.6	30	159	0.4
500	28	268	7.2	27	291	0.9	29	231	2.9	27	232	3.4	30	118	0.4
1,000	28	271	9.0	20	76	0.2	29	232	4.2	27	265	6.9	30	80	0.8
1,500	25	279	10.4	20	163	1.0	27	267	6.3	25	277	8.4	30	117	1.0
2,000	18	271	10.9	19	266	0.9	24	278	7.6	19	262	10.7	30	128	0.9
2,500	15	270	12.4	18	341	1.5	24	278	7.8	19	269	10.7	30	199	0.2
3,000	12	264	11.3	17	353	2.5	23	267	8.4	19	271	11.2	30	271	0.9
4,000				17	327	4.3	20	270	10.1	19	273	12.9	28	284	3.3
5,000				15	338	6.0	19	268	12.5	17	278	14.4	26	294	6.7
6,000				15	328	8.1	16	284	13.4	15	282	15.2	24	282	10.1
8,000							12	312	13.6	10	282	19.2	23	278	16.9
10,000													17	290	18.5
12,000													12	290	18.5

Altitude (meters) m. s. l.	Rapid City, S. Dak. (982 m.)			St. Louis, Mo. (181 m.)			San Antonio, Tex. (180 m.)			San Diego, Calif. (15 m.)		
	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity
Surface	30	339	3.9	27	242	2.9	30	82	1.3	30	295	2.8
500				27	247	4.9	30	107	1.1	30	290	2.4
1,000	30	337	4.0	25	253	6.6	29	151	0.6	29	70	0.2
1,500	30	314	5.9	22	257	8.4	29	255	2.0	29	69	1.2
2,000	29	301	9.0	19	260	10.5	27	266	4.4	28	14	1.4
2,500	27	304	10.6	18	268	10.4	26	270	6.1	28	335	1.9
3,000	26	304	12.3	18	269	12.0	25	275	8.2	27	325	3.1
4,000	23	306	13.6	17	272	13.6	22	279	9.8	21	300	6.3
5,000	21	304	15.0	16	280	15.6	19	265	11.4	17	299	8.1
6,000	19	308	16.3	13	284	16.0	18	268	12.3	14	299	8.2
8,000	16	322	19.7				14	288	17.0			
10,000	12	326	22.4				13	273	18.7			
12,000												

Altitude (meters) m. s. l.	Sault St. Marie, Mich. (230 m.)			Seattle, Wash. (12 m.)			Spokane, Wash. (603 m.)			Washington, D. C. (24 m.)		
	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity
Surface	22	300	1.7	24	206	1.3	27	196	1.2	30	252	2.3
500	22	276	2.5	24	190	3.4				30	254	3.9
1,000	19	272	4.9	24	194	6.1	27	207	3.2	29	263	4.8
1,500	13	272	7.9	24	206	7.6	24	225	5.7	29	273	7.4
2,000				19	206	7.5	23	241	6.4	29	279	10.0
2,500				19	221	7.7	21	254	7.6	23	281	11.6
3,000				16	234	7.1	18	269	9.7	22	279	12.8
4,000				13	258	9.4	14	284	9.3	20	268	14.6
5,000				11	275	12.7	14	290	11.4	16	270	18.3
6,000							11	301	14.7	15	266	18.9
8,000												
10,000												
12,000												

TABLE 3.—*Maximum free-air wind velocities, (m. p. s.), for different sections of the United States based on pilot-balloon observations during November 1941*

Section	Surface to 2,500 meters (m. s. l.)					Between 2,500 and 5,000 meters (m. s. l.)					Above 5,000 meters (m. s. l.)				
	Maximum velocity	Direction	Altitude (m.) m. s. l.	Date	Station	Maximum velocity	Direction	Altitude (m.) m. s. l.	Date	Station	Maximum velocity	Direction	Altitude (m.) m. s. l.	Date	Station
Northeast [1]	48.0	WNW	2,500	27	Boston, Mass.	61.0	WNW	2,980	27	Boston, Mass.	63.5	W	6,190	27	Portland, Maine.
East-Central [2]	36.1	WSW	2,500	1	Knoxville, Tenn.	49.0	SW	4,820	24	Richmond, Va.	85.0	SSW	7,650	8	Greensboro, N. C.
Southeast [3]	35.8	WNW	2,500	9	Tallahassee, Fla.	43.0	SW	4,150	8	Jacksonville, Fla.	58.0	WNW	11,900	16	Miami, Fla.
North-Central [4]	35.2	WNW	2,500	26	Duluth, Minn.	48.4	WNW	5,000	15	Minneapolis, Minn.	65.0	WNW	6,150 12,890	25 12	Huron, S. Dak. Minneapolis, Minn.
Central [5]	38.1	SW	1,100	18	Des Moines, Iowa	49.6	W	4,770	20	Springfield, Ill.	62.4	W	16,560	14	Wichita, Kan.
South-Central [6]	31.5	SSW	1,920	18	Tulsa, Okla.	43.2	SW NNW	4,810 4,950	19 8	Oklahoma City, Okla. Waco, Tex.	76.8	WSW	8,860	23	Abilene, Tex.
Northwest [7]	43.5	W	2,300	24	Havre, Mont.	55.0	W	3,300	24	Great Falls, Mont.	71.0	N	10,545	19	Medford, Oreg.
West-Central [8]	36.6	W	2,500	24	Cheyenne, Wyo.	44.4	WSW	3,330	16	Reno, Nev.	73.0	WNW	15,360	29	Rock Springs, Wyo.
Southwest [9]	31.8	SW	1,370	17	Las Vegas, Nev.	46.6	WNW	4,800	17	Burbank, Calif.	73.0	W	10,480	23	El Paso, Tex.

[1] Maine, Vermont, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, and northern Ohio.
[2] Delaware, Maryland, Virginia, West Virginia, southern Ohio, Kentucky, eastern Tennessee, and North Carolina.
[3] South Carolina, Georgia, Florida, and Alabama.
[4] Michigan, Wisconsin, Minnesota, North Dakota, and South Dakota.
[5] Indiana, Illinois, Iowa, Nebraska, Kansas, and Missouri.
[6] Mississippi, Arkansas, Louisiana, Oklahoma, Texas (except El Paso), and western Tennessee.
[7] Montana, Idaho, Washington, and Oregon.
[8] Wyoming, Colorado, Utah, northern Nevada, and northern California.
[9] Southern California, southern Nevada, Arizona, New Mexico, and extreme west Texas.

WEATHER ON THE NORTH ATLANTIC OCEAN

By H. C. HUNTER

Atmospheric pressure.—During November 1941 the pressure over those areas of the North Atlantic which are well covered by available reports was in the main lower than normal. This was notably the case near the Azores, where the average pressure at Horta was 5.2 millibars (0.15 inch) less than the normal November mean, owing to almost continuously subnormal pressure during the first half of the month. There were less notable deficiencies near the coast of Portugal and the east coast of the United States. On the other hand, near southeastern Nova Scotia the average pressure exceeded the monthly normal.

The extremes of pressure in the vessel reports that have been received were 1,035.2 and 985.1 millibars (30.57 and 29.09 inches). The high mark was recorded at a very early hour of the 29th near 42° N., 65° W. The low mark was noted not far to southwestward of the westernmost Azores shortly before sunrise of the 2d. A pressure substantially the same as the low mark mentioned was noted at Horta on the 7th, as table 1 indicates.

TABLE 1.—*Averages, departures, and extremes of atmospheric pressure (sea level) at selected stations for the North Atlantic Ocean and its shores, November 1941*

Station	Average pressure	Departure from normal	Highest	Date	Lowest	Date
	Millibars	*Millibars*	*Millibars*		*Millibars*	
Lisbon, Portugal [1]	1,015.9	−1.4	1,025	23–25	995	11
Horta, Azores	1,015.1	−5.2	1,030	27	985	7
Belle Isle, Newfoundland	1,008.1	.0	1,023	2	986	22
Halifax, Nova Scotia	1,016.6	+2.4	1,032	29	999	21
Nantucket	1,016.9	−.7	1,035	28	997	7
Hatteras	1,019.0	−.6	1,032	28	1,001	6
Turks Island	1,015.0	−.6	1,019	29	1,011	16, 21
Key West	1,016.3	−.3	1,023	10	1,010	6
New Orleans	1,019.6	+.3	1,031	24	1,008	5

[1] For 27 days.

NOTE.—All data based on available observations, departures compiled from best available normals related to time of observation, except Hatteras, Key West, Nantucket, and New Orleans, which are 24-hour corrected means.

Cyclones and gales.—No storms worthy of special comment affected the lower latitudes this month, and in the middle latitudes, as far as reports that have come to hand indicate, the month was comparatively undisturbed for November, save for a few days near southwestern Europe. In the portion of the ocean west of longitude

30° W. the especially quiet periods were 8th to 12th, 18th to 20th, and 27th to 29th.

A small number of vessels noted strong gales (force 9) about the middle of the month, and one ship near mid-ocean encountered a whole gale (force 10) on the 17th.

In the eastern North Atlantic a storm seems to have formed about the 1st, and during the forenoon of the 2d was indicated as having attained considerable strength, while central a short distance to west-southwestward of the western Azores. The course was apparently to southeastward during the next 3 days, then from 5th to 7th it returned northward and on the 7th was central over the island of Fayal. Afterward the movement was eastward, with apparently less intensity, and on the 11th the center was close to northern Portugal.

Much information about this storm has been received from Lt. Col. J. Agostinho, Director of the Meteorological Service of the Azores, who reports that gusts of 100 kilometers (62 miles) per hour or more were noted locally on the islands.

Waterspout on Gulf of Mexico.—On November 5 a waterspout was observed over the Gulf of Mexico. The following is a ship's account of it:

> In latitude 27°00′ N., longitude 88°45′ W., passed a large waterspout about 1 mile off, in vicinity of a rain squall. The spout resembled a big lawn sprinkler at base; then to a large column in the sky to the clouds. Air temperature 80° F.; wind variable, force 4 to 5, then to west, 3; barometer dropped 0.08 inch during squall (from 29.90 to 29.82, corrected readings).

Fog.—As is usual in the case of a fall month, comparatively little fog has been reported. Indeed, there are but 6 of the 5°-squares which include North Atlantic waters that are known to have had any fog, and only one of these has furnished reports for more than a single day. This leading square is the one from 40° to 45° N., 70° to 75° W., and even there only 3 days, well scattered in time, brought fog.

The first report since late April of fog over the Gulf of Mexico states that it was noted on the 16th, over the northwestern portion.

OCEAN GALES AND STORMS, NOVEMBER 1941

Vessel	Position at time of lowest barometer		Gale began November	Time of lowest barometer, November	Gale ended November	Lowest barometer	Direction of wind when gale began	Direction and force of wind at time of lowest barometer	Direction of wind when gale ended	Direction and highest force of wind	Shifts of wind near time of lowest barometer
	Latitude	Longitude									
NORTH ATLANTIC OCEAN	° ′	° ′				*Millibars*					
A vessel	38 30N.	48 18W.	2	2p, 1	2	1,004.4	NNW	NNE, 4	NW	NNW, 8	NNE-NNW.
Do	44 30N.	63 00W.	2	11p, 2	3	1,001.7	S	WSW, 8	WSW	SSE, 8	SSE-WSW.
Do	33 59N.	74 26W.	6	12m, 6	7	1,006.8	SW	SSW, 8	SW	SSW, 8	None.
Do	[1] 32 39N.	73 58W.	6	3a, 7	7	1,004.7	SW	WSW, 9	W	WSW, 9	SW-W.
Do	38 00N.	72 00W.	7	4a, 7	8	1,001.4	SW	S, 5	WSW	WSW, 8	S-SW.
Do	36 00N.	68 12W.	7	11p, 7	7	1,007.8	SSW	SW, 7	SW	SSW, 8	SW-WSW.
Do	38 06N.	59 30W.	12	1p, 12	13	1,007.5	NW	WNW, 7	WNW	NW, 8	WNW-NW.
Do	[1] 27 48N.	87 26W.	13	12p, 13	14	1,016.3	ENE	ENE, 7	ENE	E, 9	N-E.
Do	33 36N.	74 12W.	16	4a, 16	17	1,003.1	NNW	WNW, 8	NNE	N, 9	NNW-WNW-N.
Do	32 54N.	64 00W.	16	8a, 16	16	1,008.5	SE	SSW, 7	SSW	SE, 8	SE-SSW.
Do	39 36N.	66 18W.	17	4p, 16	17	1,000.0	WNW	NW, 3	WNW	WNW, 8	W-NW.
Do	37 48N.	60 12W.	16	8p, 16	16	1,000.7	S	S, 9	SSW	S, 9	SSE-SSW.
Do	38 06N.	56 12W.	16	2a, 17	17	1,001.4	S	S, 8	S	S, 8	S-NW.
Do	38 24N.	48 24W.	17	2p, 17	17	1,008.5	S	SSW, 10	W	SSW, 10	S-W.
Do	43 20N.	39 29W.	17	12p, 17	18	1,002.7	S	SW, 8	W	SW, 8	S-W.
Do	40 50N.	16 55W.	21	5p, 21	22	1,005.8	SW	SW, 6	W	SW, 8	None.
Do	34 18N.	75 30W.	24	1p, 24	24	1,019.6		N, 8	N	N, 8	
Do	31 24N.	67 42W.	25	4p, 25	26	1,014.9	NE	ENE, 7	NW	ENE, 8	None.
Do	38 54N.	59 54W.	30	4p, 30	30	1,010.8	SW	W, 7	WSW	SW, 8	WSW-WNW.
NORTH PACIFIC OCEAN											
A vessel	53 30N.	161 30W.	1	6a, 2	3	974.9	E	ENE, 10	E	ENE, 10	E-ENE.
Do	15 30N.	108 48W.	2	12m, 2	3	1,000.7	NNE	SE, 9	S	SE, 9	NNE-SSE.
Do	56 30N.	167 18W.	2	2p, 2	2	[2] 982.1		E, 9		E, 9	
Do	46 54N.	128 24W.	2	10p, 2	4	998.3	S	SSE, 9	SW	SSE, 9	SSE-SW.
Do	49 00N.	126 45W.	2	12p, 2	3	993.6	SE	SE, 5	SE	SE, 8	
Do	45 12N.	124 48W.	2	4a, 3	3	1,002.4	S	SSW, 7	SSW	S, 9	
Do	53 00N.	134 54W.	3	2a, 3	3	986.8	SW	ESE, 6		SW, 8	ESE-S.
Do	07 37N.	89 07W.	3	6p, 3	3	1,004.4	NNE	E, 9	SSE	E, 9	ENE-SSE.
Do	16 50N.	113 30W.	4	4a, 4	5	1,002.7	NNE	ENE, 7	ESE	ESE, 8	NE-E.
Do	56 58N.	139 11W.	4	3p, 4	4	977.7	NE	NE, 11	NE	NE, 11	None.
Do	39 12N.	141 00W.	6	9p, 6	6	1,010.8	S	S, 8	SW	S, 8	S-SW.
Do	[1] 58 51N.	141 50W.	6	10p, 6	7	1,002.0	SSE	SSE, 7	SE	SE, 8	SE-S.
Do	33 54N.	147 30W.	8	2p, 8	9	1,007.1	S	SW, 9	W	SW, 10	SW-WSW.
Do	[1] 35 03N.	145 33W.	8	4p, 8	9	1,007.1	SW	SW, 9	W	WSW, 11	SW-WSW.
Do	15 45N.	93 43W.	9	4a, 9	9	1,011.5	N	N, 6	NNW	NNW, 9	N-W.
Do	38 36N.	140 42W.	9	9a, 9	9	1,000.0	SW	SW, 8	WSW	SW, 8	SW-WSW.
Do	[1] 46 39N.	148 32W.	8	4p, 9	9	1,003.4	NNE	NNW, 8	NNW	NNW, 9	
Do	55 20N.	131 38W.	9	8a, 10	10	997.0	SE	SE, 7	SSE	SE, 8	
Do	50 36N.	141 30W.	9	4p, 10	10	[2] 992.2		NW, 8		NW, 8	
Do	12 36N.	149 36W.	10	4p, 10	11	1,003.7	NE	NE, 8	NE	NE, 8	
Do	49 15N.	131 12W.	12	11p, 12	13	[2] 969.2	SE	SE, 8	SE	ESE, 10	SE-SW.
Do	14 12N.	93 42W.	13	3a, 13	13	1,010.8	WNW	WNW, 4	NNE	N, 8	WNW-N.
Do	53 36N.	144 30W.	13	3a, 13	13	982.4	NE	NE, 8		NE, 8	NE-N.
Do	43 06N.	124 48W.	12	10a, 13	13	1,002.7	SE	SSE, 9	SW	S, 10	SSE-S.
Do	54 06N.	152 06W.	13	8a, 14	15	992.9	W	W, 5	NW	NW, 8	W-WNW.
Do	54 00N.	162 06W.	15	1a, 16	17	979.7	SW	WSW, 9	SW	WSW, 11	SSW-WSW-SW.
Do	56 36N.	147 36W.	25	8a, 24	25	994.2	W	W, 3	WNW	WNW, 9	NW-W.
Do	14 47N.	95 16W.	24	4p, 24	24	1,009.8	N	NNE, 7	NE	NNE, 10	
Do	15 24N.	93 42W.	25	6a, 26	26	1,010.5	NNE	N, 8		NW, 9	
Do	55 42N.	134 54W.	25	4a, 25	25	998.6	W	WNW, 5	WNW	W, 8	WNW-W.
Do	14 24N.	93 18W.	26	6p, 26	27	1,005.4	NNW	NW, 2	NE	N, 9	NW-NNW.
Do	26 42N.	143 00W.	27	2a, 28	28	1,006.4	SW	W, 8	WNW	WNW, 8	W-WNW.
Do	36 16N.	127 57W.	28	4p, 28	28	995.6	SSE	SSE, 8	SSE	SSE, 8	None.
Do	43 12N.	126 06W.	27	1a, 29	29	997.0	SE	SSE, 10	S	SSE, 10	
Do	59 24N.	149 54W.	28	2a, 29	28	988.8	NNW	NNE, 3	NNW	NNW, 8	NNW-NNE.
Do	43 30N.	127 00W.	28	4a, 29	29	992.2	SSE	SSE, 9	SSW	SSE, 9	
Do	[1] 23 12N.	149 52W.	30	4a, 30	30	1,009.5	WSW	WSW, 7	W	NW, 8	WSW-NNW.
Do	32 10N.	149 30W.	30	2p, 30	[3] 1	1,003.4	N	NNW, 8	NNW	NNW, 9	NNW-NNE.

[1] Position approximate. [2] Barometer uncorrected. [3] December.

WEATHER ON THE NORTH PACIFIC OCEAN

By WILLIS E. HURD

Atmospheric pressure.—For the eastern part of the North Pacific, two interesting pressure anomalies are noticeable for November. At Honolulu and Midway Island, near and in the stronghold of the usual high-pressure area, the average barometer was below the normal by 0.7 to 2.7 millibars (0.02 to 0.08 inch). At Dutch Harbor, near the heart of the usual low-pressure belt, the average barometer was above the normal by 9.6 millibars (0.28 inch). The Aleutian LOW center this month lay in the Gulf of Alaska region, the mean pressure at Juneau being 1,006.5 millibars (29.73 inches). From this point along the cost to Mazatlan, the November barometer was close to normal. The lowest determinable pressure of the month was 966 millibars (28.53 inches), read at St. Paul Island on the 16th.

TABLE 1.—*Averages, departures, and extremes of atmospheric pressure (sea level) at selected stations for the North Pacific Ocean and its shores, November 1941*

Station	Average pressure	Departure from normal	Highest	Date	Lowest	Date
	Millibars	*Millibars*	*Millibars*		*Millibars*	
Barrow	1,016.1	+0.5	1,032	6, 27	987	30
Dutch Harbor	1,011.6	+9.6	1,032	27	972	16
St. Paul	1,009.5	+7.5	1,033	26	966	16
Juneau	1,006.8	−1.0	1,030	20	978	13
Tatoosh Island	1,015.9	+1.0	1,034	20	992	13
San Francisco	1,018.3	−.7	1,027	24	1,012	17
Mazatlan	1,011.9	−.3	1,014	8, 14, 29	1,009	5, 20, 21
Honolulu	1,013.9	−2.7	1,019	11	1,010	17
Midway Island	1,017.9	−.7	1,026	30	1,010	23
Guam	1,010.9	−.3	1,020	16	1,007	19

NOTE.—Data based on 1 daily observation only, except those for Juneau, Tatoosh Island, San Francisco, and Honolulu, which are based on 2 observations. Departures are computed from best available normals related to time of observations.

Extratropical cyclones and gales.—On the 2d and again on the 16th-17th deep cyclones appeared over the Aleutian Islands. Central pressures were well below 982 millibars (29 inches), and heavy storminess prevailed over a considerable area. Gales of force 9–10 were reported both north and south of the Alaska Peninsula on the 2d, and of force 11 south of the peninsula on the 17th.

For all western waters of the Pacific, reports are negligible to wanting, but for eastern waters, numerous cyclones of varying degrees intensity occurred in the Gulf of Alaska and on parts of the ocean between the Hawaiian Islands and the American mainland north of southern California. In middle latitudes, between about 135° and 150° W., depressions were rather frequent. They were of no great barometric depth, but caused gales of force 8 on several days between the 6th and the 30th. On the 8th and 9th, near 34°–36° N., 145°–148° W., winds of force 9 to 11 were encountered, with barometers no lower than 1,007 millibars (29.74 inches). Farther north, force 8–9 gales occurred on several days, with the highest wind, of force 11, and a low barometer of 977.7 millibars (28.87 inches), observed near 57° N., 139° W. A still lower barometer, 28.62 inches (uncorrected), was read on a ship in the midst of a force-10 gale, near 49° N., 131° W.

In near coastal waters of the United States there were several days with south to southeasterly gales ranging in force from 8 to 10. On the 2d, of force 8–9, they were mostly experienced off Washington and Oregon. Close in on the southern Oregon coast a force-10 gale was reported on the 13th, and again on the 29th, on which date the barometer dropped to 992.2 millibars (29.30 inches). Off the central California coast a gale on the 28th attained a force of 8.

Tropical disturbances.—At least one tropical cyclone, of moderate intensity, formed in extreme southeastern waters. A ship on November 2 had a southeast wind of force 9, barometer 1,000.7 millibars (29.55 inches), near 15½° N., 108° W. On the 4th a vessel near 17° N., 113° W., had a southeasterly gale of force 8, with nearly as low barometer.

It appears that another small cyclone in low latitudes occurred also on the 3d, since a ship near 7½° N., 89° W., had an east gale of force 9, preceded by north-northeasterly and succeeded in the afternoon by south-southeasterly winds. The barometer fell to 1,004.4 millibars (29.66 inches).

Intensified trade wind.—During much of the 10th a northeast trade wind of force 8 was experienced in the vicinity of 12° N., 149° W.

Tehuantepecers.—Northerly gales in and near the Gulf of Tehuantepec were reported as follows: Of force 8 on the 13th; of force 9 on the 25th, 26th, and 27th; and of force 10 on the 24th.

Fog.—Fog was particularly frequent in near coastal waters of California, where it was reported on 15 days. The greatest concentration was along the middle coast. It was reported on 2 days off Oregon and on 3 days off Lower California. A few scattered fogs occurred well at sea during the first 6 days of the month.

RIVER STAGES AND FLOODS

By BENNETT SWENSON

The interior of the country, following a period of excessive rainfall, was relatively dry during November. However, flooding continued from the previous month in portions of the lower Mississippi and Arkansas River Basins and in the upper Red River Basin. The flooding in the Arkansas River in November reached the highest stage since June 1833 in the reach from Webbers Falls, Okla., to slightly below Van Buren, Ark.

Light to moderate floods occurred in other sections as eastern Texas, Pecos River in Texas, Willamette River in Oregon and in portions of the upper Mississippi Valley.

In the more eastern States, where both September and October were extremely dry, the rainfall in November was much below normal. The river stages in this area, showed little change, remaining well below normal.

Atlantic Slope, East Gulf of Mexico and Ohio River Drainage.—Precipitation during the month was below normal except in Florida and Mississippi. The lack of moisture, which has been prevalent during most of the year, resulted in little changes in the river stages. Some increases in stages occurred from lowered temperatures, particularly in extreme northern sections, but generally the stages were well below normal.

Upper Mississippi Basin.—Heavy rains on October 31 and November 1, resulted in light to moderate flooding at a few points. The Wisconsin River overflowed its banks slightly at Knowlton, Wis., on the 2d and 3d, with a peak stage of 12.9 feet on the 2d. Light flooding occurred also in the lower portions of the Des Moines, Rock and Meramec Rivers during the first week of the month with stages from 1 to 2 feet above flood stage. Flood damage was slight.

A slight overflow occurred in the lower Illinois River at Havana and Beardstown, Ill., from the 4th to the 22d. A rise began in the Mississippi River proper early in the

month from the heavy rains on October 31. Further rains during the first week of November resulted in light overflows from Keokuk, Iowa, to Cape Girardeau, Mo. The gage at Cairo, Ill., showed a mean stage of 24.8 feet during the month, compared with a 60-year normal of 13.4 feet for November.

Missouri River Basin.—The Grand River in Missouri and the Osage River in Missouri and Kansas were in moderate flood during the first few days of November. These floods resulted largely from heavy rains on the last day of October. As greater floods had occurred in these rivers during October, little or no additional damage resulted.

A slight overflow of .9 foot in the Solomon River at Beloit, Kans., on November 20, resulted in no appreciable damage.

The extreme lower Missouri River continued in flood from the previous month. The crest reached 24.6 feet at Hermann, Mo., flood stage 21 feet, on November 4, and the river crested at 30.6 feet at St. Charles, Mo., flood stage 25 feet, on November 6. Stages about as high or higher had occurred at these points during October.

White River Basin.—Excessive rains during the latter part of October, resulted in moderately high floods, beginning on October 31 in the upper part of the basin at Black Rock and Calico Rock, Ark., and continuing until November 27 at the lowest gaging station, St. Charles, Ark. The total loss has been estimated at $145,000, of which $100,000 was to matured crops.

Arkansas River Basin.—Overflows continued in the tributaries of the Arkansas River in Oklahoma and Kansas from the previous month. The flood in the Arkansas River from the vicinity of Webbers Falls, Okla., to a short distance below Van Buren, Ark., was approaching major proportions at the end of October. The river crested at Webbers Falls on November 1, with a stage of 35.8 feet, and at Fort Smith and Van Buren, Ark., on November 2–3, with stages of 37.3 and 35.8 feet, respectively. These stages are the highest since the flood of June 1833, and exceed the stages in the April 1927 flood. As the flood progressed downstream, it decreased in intensity; at Little Rock, Ark., a crest of 26.3 feet occurred on November 7.

Considerable damage was caused by the high water, the heaviest damage occurring in the Fort Smith area. As complete reports are not available at this time, a further report will be made on damages and other aspects of the flood.

Red River Basin.—Heavy rains late in October, over the extreme upper Red River Basin, resulted in damaging floods in the smaller tributaries in Oklahoma and Texas as reported last month. The discharge from these streams caused the Red River to overflow its banks by 1 to 3 feet at Arthur City, Tex., and Index and Fulton, Ark., during the first week in November.

Lower Mississippi Basin.—Heavy rainfall over the upper St. Francis Basin on October 31, caused rising stages in the St. Francis River. The river reached a stage of 1.9 feet above flood stage at Fisk, Mo., on November 6.

West Gulf of Mexico drainage.—Local overflows occurred in the Trinity, Neches, and Sabine Rivers early in November. Damages estimated at $5,000 were reported in the vicinity of Liberty, Tex., on the Trinity River. No damage was reported along the Neches and Sabine Rivers.

The flood in the Pecos River that began in the irrigation district south of Red Bluff Dam on October 25 continued above flood stage at Pecos, Tex., until November 6. Very little, if any, precipitation occurred during the entire period. The continued heavy flow was produced almost entirely by the steady spilling of water over Red Bluff Dam.

Columbia River Basin.—Moderate flooding occurred in the Willamette River Basin from November 15–18 from heavy precipitation during the period 11–17th. On the night of the 14–15th, an area of approximately 6,640 square miles, received unusually heavy precipitation. The average 24-hour precipitation over this area was well over 3 inches.

The following flood résumé is quoted from a report, Daily and Hourly Precipitation Supplement, Storm of November 11–17, 1941, Weather Bureau, in cooperation with Departments of War and Agriculture, by the Hydrologic Supervisor, Portland, Oreg.:

> The area covered by the flood extended from the east side of the Willamette River in the vicinity of Corvallis to slightly above the junction of the Row River with the Coast Fork. This confluence occurs about 2½ miles north of Cottage Grove. Flood control dams under construction on the Coast Fork and Long Tom Rivers were completed to such a stage that they proved their effectiveness as flood barriers. The control of water at these two dams averted serious industrial and agricultural losses in the vicinity of Cottage Grove and Monroe. Extensive riprapping along the Willamette River, constructed by the United States Engineers, materially reduced bank erosion below Eugene. Channel development from the mouth of the Willamette River south to Albany aided considerably in speeding up run-off, thereby reducing flood crests in these reaches of the river. The streams which contributed the greatest volume of flood water were the Middle Fork of the Willamette and the Row River, although the McKenzie, Calapooya and Santiam were very important factors in producing the flood conditions. Maries, Luckiamute, Yamhill, Molalla, Tualatin, and Clackamas Rivers, while contributing some water, could be considered as rather minor factors in this flood.
>
> Although wide distribution was given to accurate and timely warnings, there was considerable damage. Had the flood occurred during the middle of October instead of the middle of November, agricultural losses would have been much more severe. Cover crops played a very important part in limiting soil erosion. Many of the wells in the flooded area were contaminated, which constitutes a potential danger, and it would be almost impossible to estimate the damage. An attempt has been made to classify losses as agricultural (erosion, crops, stock, fences, roads, etc.), industrial (including small businesses) and domestic (damaged household goods, heating plants, loss of foodstuff, etc., including reconditioning). Statistics of cost of rescue work are not available at this time. The estimated flood damages included in this résumé may show some slight alterations when complete data are received.

Agriculture:	
Crops	$7, 900. 00
Livestock and poultry	4, 200. 00
Damage to roads and highways	2, 500. 00
Fences	1, 500. 00
Erosion	100, 000. 00
Industrial loss:	
Manufacturing plants and equipment	10, 000. 00
Loss of business	3, 000. 00
Auto camps, garages, filling stations	8, 000. 00
Stores	500. 00
Logs	500. 00
Domestic:	
Damage and loss of furniture	5, 000. 00
Food supplies	400. 00
Total	143, 500. 00

ESTIMATED FLOOD LOSSES AND SAVINGS FOR NOVEMBER 1941 [1]

River and drainage	Tangible property	Matured crops	Prospective crops	Livestock and other movable farm property	Suspension of business	Total losses	Total savings
Upper Mississippi Basin							
Des Moines River		$2,000				$2,000	
Mississippi River		6,000				6,000	$2,000
White River Basin							
White River (Arkansas)	$35,000	100,000	$5,000	$5,000		145,000	75,000
West Gulf of Mexico							
Trinity River	4,000				$1,000	5,000	10,000
Pacific Slope drainage							
Willamette River [2]						[2] 143,500	

[1] Complete figures for Arkansas River not available.
[2] See text for break-down of losses.

ESTIMATED FLOOD LOSSES AND SAVINGS FOR OCTOBER 1941

River and drainage	Tangible property	Matured crops	Prospective crops	Livestock and other movable farm property	Suspension of business	Total losses	Total savings
Missouri River Basin							
Solomon River	$30,000	$20,000	$9,000			$59,000	
Smoky Hill River	234,000	350,000	141,000	$72,500	$20,000	817,500	$10,000
Blue River	71,000	140,000	50,000	10,000	6,000	277,000	35,000
Kansas River	165,600	1,319,900	656,150	286,000	190,000	2,617,650	502,000
Big Stranger Creek (Kans.)	100,000	400,000	100,000			600,000	15,000
Osage River	52,000	302,500	402,700	1,900	2,000	761,100	155,000
White River Basin							
White River	500	60,000			5,000	65,500	
Arkansas River Basin [1]							
Cow Creek [2]						595,000	
Cottonwood River	285,000	215,000	200,000	50,000	5,000	755,000	320,000
Neosho River (Kans.)	183,500	818,500	272,150	26,500	26,250	1,326,900	375,000
North Canadian River [3]	308,000	152,000	2,900	1,200	2,750	466,850	
Canadian River [3]	28,000	80,500	3,000			111,500	
West Gulf of Mexico drainage							
Pecos River [3]						[4] 2,273,380	200,000
Rio Grande [3]						71,170	
Rio Grande	25,000	1,000	15,000		10,000	51,000	10,000
Gulf of California drainage							
Gila River (New Mex.) [5]						245,200	

[1] Data for Canadian, Verdigris, Cimarron, and Arkansas Rivers not available.
[2] At and in vicinity of Hutchinson, Kans.
[3] For month of September.
[4] Supersedes figure published in September REVIEW
[5] $500,000 loss in Arizona included in September REVIEW.

FLOOD-STAGE REPORT, NOVEMBER 1941

[All dates in November unless otherwise specified]

River and station	Flood stage	Above flood stages—dates: From—	To—	Crest: Stage	Date
MISSISSIPPI SYSTEM					
Upper Mississippi Basin					
	Feet			*Feet*	
Wisconsin: Knowlton, Wis	12	2	3	12.9	2
Rock: Moline, Ill	10	1	9	10.3	3–5
Des Moines:					
Tracy, Iowa	14	1	3	15.6	1–2
Eddyville, Iowa	15	1	4	17.4	3
Ottumwa, Iowa	9	2	4	10.2	3
Illinois:					
Havana, Ill	14	6	18	14.6	11
Beardstown, Ill	14	4	22	15.5	13–15
Meramec: Pacific, Mo	11	2	3	12.6	3
Mississippi:					
Keokuk, Iowa	12	5	6	12.5	5
Quincy, Ill	14	4	9	14.9	6
Hannibal, Mo	13	1	16	15.1	7
Louisiana, Mo	12	1	14	13.6	7

FLOOD-STAGE REPORT, NOVEMBER 1941—Continued

[All dates in November unless otherwise specified]

River and station	Flood stage	Above flood stages—dates: From—	To—	Crest: Stage	Date
MISSISSIPPI SYSTEM—Continued					
Upper Mississippi Basin—Con.					
Mississippi—Continued.	*Feet*			*Feet*	
Grafton, Ill	18	4	11	19.3	8
Chester, Ill	27	3	11	29.1	8
Cape Girardeau, Mo	32	8	10	32.1	9–10
Missouri Basin					
Solomon: Beloit, Kans	18	20	20	18.9	20
Grand:					
Gallatin, Mo	20	1	3	22.7	2
Chillicothe, Mo	18	Oct. 31	5	27.2	3
Brunswick, Mo	12	2	6	13.3	3
Osage:					
Quenemo, Kans	30	1	2	32.0	1
Ottawa, Kans	24	1	2	25.1	2
LaCygne, Kans	25	1	5	28.3	4
Trading Post, Kans	24	1	6	25.75	5
Osceola, Mo	20	(1)	10	32.5	2
Lakeside, Mo	60	(1)	11	61.7	Oct. 31–Nov. 1
St. Thomas, Mo	23	(1)	9	31.7	3
Missouri:					
Hermann, Mo	21	(1)	8	24.6	4
St. Charles, Mo	25	Oct. 31	10	30.6	6
White Basin					
Black:					
Poplar Bluff, Mo	16	2	3	17.3	3
Black Rock, Ark	14	Oct. 31	9	18.5	2
White:					
Calico Rock, Ark	18	Oct. 31	4	27.4	1
Batesville, Ark	23	Oct. 31	5	30.9	2
Newport, Ark	26	3	7	28.1	5
Georgetown, Ark	21	4	17	24.0	9–10
Des Arc, Ark	24	8	17	26.3	12
Clarendon, Ark	26	10	23	27.7	15–16
St. Charles, Ark	25	13	27	26.1	18–20
Arkansas Basin					
Verdigris:					
Sageeyah, Okla	35	(1)	5	42.6	1
Okay, Okla	27	(1)		30.8	4
Neosho:					
LeRoy, Kans	23	1	1	23.75	1
Iola, Kans	15	1	2	16.6	1
Chanute, Kans	20	1	3	22.2	2
Parsons, Kans	22	(1)	5	27.4	Oct. 31
Oswego, Kans	17	(1)	6	25.0	Oct. 31
Ft. Gibson, Okla	22	(1)	7	35.4	2
North Canadian:					
Yukon, Okla	8	(1)	(2)		(3)
East Oklahoma City, Okla	14		Oct. 31		
Poteau: Poteau, Okla	21	(1)	4	28.0	3
Petit Jean: Danville, Ark	20	(1)	4	24.0	1
Arkansas:					
Webbers Falls, Okla	23	(1)	8	35.8	1
Fort Smith, Ark	22	(1)	10	37.3	2–3
Van Buren, Ark	22	(1)	10	35.8	2–3
Ozark, Ark	22	Oct. 31	9	33.0	4–5
Dardanelle, Ark	22	(1)	11	32.0	6
Morrilton, Ark	20	(1)	11	29.1	6
Little Rock, Ark	23	2	11	26.3	7
Pine Bluff, Ark	25	2	12	30.6	8–9
Red Basin					
Sulphur: Ringo Crossing, Tex	20	(1) 23	4 23	[4] 25.5 [4] 20.0	1 23
Red:					
Arthur City, Tex	27	2	4	28.3	3
Index, Ark	25	4	7	26.3	6
Fulton, Ark	25	4	9	28.0	7
Lower Mississippi Basin					
St. Francis: Fisk, Mo	20	2	9	21.85	6
Coldwater: Coldwater, Miss	13	1 23	4 26	13.7 13.7	3 25
WEST GULF OF MEXICO DRAINAGE					
Sabine: Logansport, La	25	1	5	25.8	1
Neches: Rockland, Tex	22	1	8	24.9	2
East Fork of Trinity: Rockwall, Tex	10	Oct. 31	3	11.3	2
Trinity: Liberty, Tex	24	1	9	26.7	5
Pecos: Pecos, Tex	13	Oct. 25	6	14.1 14.0	Oct. 28 1–4
PACIFIC SLOPE DRAINAGE					
Columbia Basin					
Middle Fork of Willamette: Eula, Oreg	13	15	15	13.3	15
Coast Fork of Willamette: Saginaw, Oreg	9	15	16	10.4	15
McKenzie: Leaburg, Oreg	12	15	16	15.4	15
Long Tom: Monroe, Oreg	10	17	18	10.7	17
Santiam: Jefferson, Oreg	13	15	17	16.55	16
Willamette:					
Eugene, Oreg	12	15	16	15.0	15
Harrisburg, Oreg	10	15	18	15.6	16

[1] Continued from preceding month.
[2] Continued into following month.
[3] Crest occurred in October; high water returned slowly to main channel of stream.
[4] Gage out; stages estimated.

CLIMATOLOGICAL DATA

CONDENSED CLIMATOLOGICAL SUMMARY OF TEMPERATURE AND PRECIPITATION BY SECTIONS

[For description of tables, see REVIEW, January 1940, p. 32]

In the following table are given for the various sections of the climatological service of the Weather Bureau the monthly average temperature and total rainfall; the stations reporting the highest and lowest temperatures, with dates of occurrence; the stations reporting the greatest and least total precipitation; and other data as indicated by the several headings.

The mean temperature for each section, the highest and lowest temperatures, the average precipitation, and the greatest and least monthly amounts are found by using all trustworthy records available.

The mean departures from normal temperatures and precipitation are based only on records from stations that have 10 or more years of observations. Of course, the number of such records is smaller than the total number of stations.

Section	Temperature								Precipitation					
			Monthly extremes								Greatest monthly		Least monthly	
	Section average	Departure from the normal	Station	Highest	Date	Station	Lowest	Date	Section average	Departure from the normal	Station	Amount	Station	Amount
	°F.	°F.		°F.			°F.		In.	In.		In.		In.
Alabama	54.3	0.0	Geneva	85	20	Valley Head	21	[1]12	2.51	−0.90	Wadley	5.12	Clayton	0.15
Arizona	50.9	+.3	2 stations	93	[1]6	Alpine	−8	20	1.00	.00	Cibecue	3.23	Amado	T
Arkansas	49.9	−1.3	Camden	87	16	4 stations	18	[1]24	2.31	−1.45	Springbank	5.98	Osceola	1.28
California	53.3	+1.0	2 stations	98	[1]5	Tamarack	1	18	1.95	−.33	Cummings	14.50	San Clemente	T
Colorado	36.9	+1.8	Fort Morgan	85	15	Fraser	−22	23	.42	−.35	Cumbers	1.95	Utleyville	.00
Florida	65.8	+.8	Raiford	94	3	Mason	20	9	3.40	+1.20	Fort Lauderdale	8.23	Mount Pleasant	.73
Georgia	54.9	+.4	Brunswick	89	1	Blairsville	14	12	1.68	−.93	Taylorsville	4.96	Hawkinsville	.31
Idaho	37.1	+1.7	Midway	74	11	Driggs	−17	20	1.93	−.10	Roland	6.30	Howe	T
Illinois	44.2	+2.1	Fairfield	79	17	4 stations	7	24	2.63	+.04	Paris	4.64	Belvidere	1.00
Indiana	44.0	+1.7	Tell City	83	[1]18	Wheatfield	7	24	2.84	−.20	Valparaiso	4.67	Salem	1.49
Iowa	40.0	+3.7	2 stations	78	17	Sibley	2	23	1.71	+.10	Alta	3.96	Melrose	.67
Kansas	45.1	+1.9	Scott City	87	15	2 stations	−4	23	.88	−.41	Moran	3.21	Bird City (near)	.12
Kentucky	46.0	−.4	Quicksand	85	17	Lynch (near)	9	11	2.80	−.59	Russellville	4.00	Pikeville	1.51
Louisiana	56.2	−2.6	Schriever	86	20	2 stations	23	25	2.83	−1.06	Calhoun	5.46	Angola	.40
Maryland-Delaware	48.0	+2.8	2 stations	78	[1]18	do	11	25	1.84	−.70	Williamsport, Md	3.17	Pocomoke City, Md	.54
Michigan	38.8	+2.7	Holland	74	19	Watersmeet	−3	24	2.84	+.33	Detour	5.02	Stephenson	1.16
Minnesota	32.9	+3.3	Farmington	72	18	Hallock	−12	[1]22	.57	−.59	Grand Meadow	2.55	4 stations	T
Mississippi	53.0	−2.0	Magnolia	85	3	Rochdale	19	25	3.62	+.01	Duck Hill	7.66	Bay St. Louis	1.04
Missouri	45.5	+1.2	3 stations	85	[1]16	Unionville	10	24	2.29	−.39	St. Louis (Washington University)	4.57	Grant City	.63
Montana	35.3	+3.2	Winifred	72	11	Frazer	−27	22	1.33	+.31	Heron	4.05	Whitehall (near)	.13
Nebraska	40.5	+3.2	Beaver City	85	12	Nenzel (near)	−20	23	.59	−.16	Tekamah	2.76	2 stations	.00
Nevada	40.5	+.6	Overton	89	5	3 stations	−11	[1]20	.74	+.11	Lamoille	2.56	do	.00
New England	40.7	+2.7	Franklin, N. H	78	21	2 stations	−2	30	2.96	−.49	Rockland, Maine	5.57	Provincetown, Mass	1.16
New Jersey	46.8	+3.1	Charlotteburg	78	20	Layton	13	25	2.90	−.30	Elizabeth	4.03	Atlantic City	1.31
New Mexico	43.5	+1.1	2 stations	84	[1]3	2 stations	−12	[1]20	.39	−.26	White Tail	2.27	17 stations	.00
New York	42.4	+4.3	Voorheesville	76	19	do	7	[1]13	2.37	−.62	New York University	4.32	Andover	.68
North Carolina	51.1	+1.2	Kinston	82	[1]1	Banners Elk	10	25	1.36	−1.29	Highlands	4.67	New Bern	.19
North Dakota	30.5	+3.8	Ellendale	69	12	Portal	−17	22	.40	−.18	Westhope	1.21	Fort Yates	T
Ohio	43.8	+2.3	Portsmouth	77	18	McArthur	12	25	1.89	−.80	Athens	3.33	2 stations	1.12
Oklahoma	49.9	+.2	Norman (University of Oklahoma)	86	16	2 stations	9	23	1.36	−.86	Watts	3.10	Kenton	.02
Oregon	42.7	+2.3	Powers	80	7	Wickiup Dam	−7	22	3.71	+.06	Willow Creek	17.06	Andrews	.34
Pennsylvania	44.2	+2.8	Shawmont	83	20	Coudersport	9	25	2.46	−.39	Shaffers Path	4.77	Kylertown	.87
South Carolina	54.8	+1.0	2 stations	86	1	6 stations	21	[1]9	1.08	−1.25	Caesars Head	4.53	Winnsboro	.19
South Dakota	36.8	+3.6	Fairfax	82	[1]12	Ardmore	−18	23	.23	−.38	Hardy Ranger Station	.80	4 stations	T
Tennessee	47.7	−.8	Celina	81	17	Erwin	14	13	2.79	−.74	Dickson	4.35	Erwin	1.17
Texas	55.8	−1.3	Alice	94	3	Stratford	8	23	1.20	−.98	Marshall	5.64	2 stations	.00
Utah	37.7	+.3	St. George	77	6	Ibapah	−10	[1]21	1.17	+.23	Rice Canyon	5.20	do	T
Virginia	48.5	+1.9	Columbia	82	2	Mountain Lake	9	25	1.27	−1.16	Pinnacles	3.79	Moores Creek Dam	.14
Washington	42.6	+2.9	2 stations	72	[1]7	2 stations	9	22	4.21	−.76	Big Four	18.62	Ephrata	.61
West Virginia	44.3	+1.1	do	80	[1]1	do	6	25	2.31	−.42	Point Pleasant	3.88	New Cumberland	1.18
Wisconsin	37.1	+3.7	Richland Center	73	17	Minocqua	−5	22	1.36	−.49	Racine	2.58	Superior	.47
Wyoming	33.9	+2.4	Hawk Springs	78	16	Yoder	−28	23	.73	+.03	Northeast Entrance	2.95	Shawnee	.05
Alaska (October)	29.4	−.7	ParkMcKinley	68	1	2 Stations	−15	15	3.78	+.22	Little Fort Walter	46.64	Wiseman	.05
Hawaii	72.2	+.8	Waianae	91	[1]20	Haleakala	30	30	3.90	−3.79	Hakalau	15.24	3 stations	.00
Puerto Rico	77.3	+1.0	6 stations	94	6	Guineo Reservoir	56	12	6.01	−.99	Bayaney	12.43	Santa Isabel	1.01

[1] Other dates also.

CLIMATOLOGICAL DATA FOR WEATHER BUREAU STATIONS

District and station	Elevation of instruments: Barometer above sea level	Elevation of instruments: Thermometer above ground	Elevation of instruments: Anemometer above ground	Pressure: Station, reduced to mean of 24 hours	Pressure: Sea level, reduced to mean of 24 hours	Pressure: Departure from normal	Temperature of the air: Mean max.+mean min.÷2	Temperature: Departure from normal	Temperature: Maximum	Temperature: Date	Temperature: Mean maximum	Temperature: Minimum	Temperature: Date	Temperature: Mean minimum	Temperature: Greatest daily range	Mean wet thermometer	Mean temperature of the dewpoint	Mean relative humidity	Precipitation: Total	Precipitation: Departure from normal	Precipitation: Days with 0.01 inch, or more	Wind: Average hourly velocity	Wind: Prevailing direction	Wind: Maximum velocity: Miles per hour	Wind: Maximum velocity: Direction	Wind: Maximum velocity: Date	Clear days	Partly cloudy days	Cloudy days	Average cloudiness, tenths	Total snowfall	Snow, sleet, and ice on ground at end of month
	Ft.	Ft.	Ft.	In.	In.	In.	°F.	°F.	°F		°F	°F		°F	°F	°F.	°F.	%	In.	In.		Miles								0-10	In.	In.
New England							**41.6**	**+3.4**										**75**	**2.57**	**-0.7**										**5.3**		
Eastport	75	67	85	29.88	29.96	-0.05	39.2	+2.5	62	20	46	6	30	33	25	37	33	80	1.79	-1.5	8	10.7	sw.	34	e.	7	8	9	13	6.3	T	0.0
Greenville, Maine	1,070	6	41	28.77	29.96	-----	31.8	+.5	56	5	41	-2	30	23	31	30	26	---	2.69	-----	13	-----	nw.	-----	-----	---	7	7	16	----	3.9	1.0
Portland, Maine [1]	103	5	36	29.86	29.98	-.03	39.9	-----	71	20	50	11	25	29	37	34	30	75	2.89	-.6	8	8.3	w.	36	w.	24	16	8	6	4.6	T	.0
Concord [2]	289	54	72	29.67	29.99	-.07	39.8	+2.1	72	19	52	9	25	28	45	34	29	76	3.34	+.3	8	6.8	nw.	28	nw.	16	8	15	7	5.3	1.3	.0
Burlington [2]	403	11	48	29.52	29.97	-.08	39.3	+3.0	66	19	47	12	30	32	26	35	30	74	1.35	-1.3	9	10.7	s.	34	s.	25	3	5	22	7.8	.5	.0
Northfield	876	12	60	29.01	29.99	-.06	37.8	+5.0	69	20	47	12	13	28	38	-----	-----	---	2.35	-.6	9	8.1	sw.	24	sw.	20	4	14	12	6.9	1.1	.0
Boston [1]	124	33	62	29.87	30.00	-.05	48.0	-----	75	19	57	26	13	40	29	41	35	66	2.40	-1.1	8	11.1	w.	28	w.	21	9	13	8	5.0	T	.0
Nantucket	12	10	63	30.01	30.03	-.02	48.6	+4.2	62	20	55	33	25	42	21	45	41	79	2.02	-1.2	6	11.4	sw.	32	sw.	23	13	11	6	4.3	.0	.0
Block Island	26	11	46	30.00	30.04	-.02	48.8	+4.2	63	7	54	30	25	43	19	45	40	74	2.38	-1.2	8	16.7	sw.	42	nw.	16	18	6	6	3.5	.0	.0
Providence [1]	159	65	74	29.85	30.03	-.04	46.5	-----	72	19	56	21	25	36	32	41	36	75	2.79	-.3	7	8.3	sw.	30	sw.	20	13	11	6	4.6	T	.0
Hartford [1]	159	5	44	29.84	30.02	-.06	45.2	-----	71	19	56	21	25	34	34	39	35	78	3.05	-.5	7	8.2	sw.	28	n.	16	9	13	8	5.4	T	.0
New Haven [2]	107	74	153	29.92	30.04	-.03	47.8	+5.8	67	19	56	28	25	39	24	40	36	76	3.95	+.6	6	7.6	sw.	23	sw.	7	11	14	5	4.8	.0	.0
Middle Atlantic States							**50.1**	**+4.5**										**69**	**1.64**	**-0.9**										**4.9**		
Albany [1]	97	26	40	29.90	30.00	-.08	42.4	-----	69	19	52	23	29	33	38	37	32	71	1.44	-1.3	9	9.2	s.	31	nw.	24	4	13	13	6.5	T	.0
Binghamton	871	57	79	29.08	30.03	-.06	44.2	+5.5	72	19	53	23	25	36	32	39	34	72	2.43	.0	9	6.2	w.	22	se.	1	3	9	18	7.5	.1	.0
New York	314	415	454	29.70	30.04	-.05	49.6	+5.4	70	20	57	31	25	42	26	42	35	62	2.78	-.2	6	15.9	sw.	46	nw.	21	13	13	4	4.3	.0	.0
Harrisburg [1]	374	30	49	29.66	30.07	-.04	46.5	-----	70	5	57	23	25	36	38	39	33	69	1.92	-.3	4	6.7	w.	28	nw.	16	11	6	13	5.5	T	.0
Philadelphia [2]	114	174	367	29.94	30.07	-.03	50.4	+4.7	73	20	58	32	25	42	25	41	37	76	2.36	-.3	5	11.9	sw.	33	s.	1	10	14	6	4.6	.0	.0
Reading	323	47	306	29.71	30.07	-----	47.8	+4.0	73	20	57	26	25	38	32	40	33	63	1.74	-1.0	5	10.7	w.	34	e.	1	11	10	9	4.9	.0	.0
Scranton	805	72	104	29.16	30.04	-.05	44.8	+4.3	69	19	53	23	25	36	30	-----	-----	---	1.92	-.8	6	6.5	sw.	31	nw.	16	8	9	13	5.7	T	.0
Atlantic City	52	37	172	30.01	30.07	-.03	51.0	+5.4	66	30	58	29	25	44	29	45	40	70	1.31	-1.5	4	14.7	w.	38	s.	23	12	10	8	4.6	.0	.0
Trenton	190	89	107	29.86	30.06	-----	48.3	+3.9	73	20	58	27	25	39	32	41	35	67	2.66	-.1	5	8.1	s.	26	s.	20	9	12	9	5.3	.0	.0
Baltimore [2]	123	100	215	29.94	30.08	-.03	52.0	+5.7	77	20	61	32	25	43	29	42	37	68	1.32	-1.2	5	9.3	sw.	29	s.	20	13	12	5	4.5	.0	.0
Washington [2]	112	62	85	29.96	30.08	-.04	50.4	+5.2	75	20	61	28	25	39	39	41	36	66	.81	-1.6	5	5.8	nw.	20	nw.	26	15	10	5	4.1	.0	.0
Cape Henry	18	8	54	30.07	30.09	-----	54.6	+2.5	77	1	62	35	13	47	20	48	43	71	.59	-1.8	5	10.1	sw.	34	n.	24	15	7	8	4.0	.0	.0
Lynchburg	686	144	184	29.36	30.12	-.01	50.3	+3.1	77	14	64	25	25	37	46	40	33	62	1.28	-1.0	6	6.3	w.	23	s.	1	14	8	8	4.2	.0	.0
Norfolk [2]	91	80	125	30.01	30.11	.00	55.9	+4.5	76	1	65	33	12	47	30	46	43	82	1.57	-.6	3	8.3	sw.	23	n.	24	16	5	9	4.2	.0	.0
Richmond [2]	144	11	52	29.94	30.10	-.02	51.4	+3.1	78	20	65	25	13	38	42	39	34	73	.46	-1.8	5	7.1	sw.	21	sw.	6	17	8	5	3.3	.0	.0
South Atlantic States							**56.6**	**+2.1**										**76**	**1.47**	**-0.9**										**4.0**		
Asheville	2,253	89	104	27.76	30.15	+.01	46.9	+1.8	77	1	60	22	25	34	49	39	34	71	1.28	-1.0	6	7.5	nw.	25	nw.	24	15	7	8	3.7	T	.0
Charlotte [2]	779	63	86	29.27	30.11	-.02	52.8	+2.2	77	16	64	29	12	41	37	42	37	71	.79	-1.5	7	5.9	sw.	22	sw.	6	17	8	5	3.4	.0	.0
Greensboro [1]	886	6	56	29.17	30.13	-----	48.4	-----	74	16	64	20	26	33	49	39	34	71	.64	-----	6	6.9	sw.	24	sw.	1	15	5	10	4.1	.0	.0
Hatteras	11	5	50	30.08	30.09	-.02	58.6	+2.3	79	1	65	38	12	52	20	54	51	83	3.24	-.2	9	11.4	n.	31	n.	24	16	4	10	4.2	.0	.0
Raleigh [1]	376	27	69	29.71	30.12	-.01	53.4	-----	76	1	66	27	12	40	43	44	39	68	.51	-1.8	4	7.5	sw.	29	sw.	6	15	7	8	3.9	.0	.0
Wilmington	72	73	107	-----	30.11	-.01	57.7	+1.7	80	23	69	32	26	47	33	-----	-----	74	.31	-1.6	2	8.0	n.	27	s.	1	19	3	8	----	.0	.0
Charleston [2]	48	11	92	30.05	30.10	-.02	60.2	+2.1	81	1	68	36	26	52	25	50	48	87	2.36	+.2	5	9.8	n.	25	ne.	17	12	11	7	4.7	.0	.0
Columbia, S. C. [2]	347	70	91	29.74	30.11	-.01	55.9	+1.9	80	16	68	29	26	44	37	47	44	79	.46	-1.5	3	7.5	ne.	27	sw.	6	18	7	5	3.5	.0	.0
Greenville, S. C.	1,040	70	78	29.00	30.12	-----	52.6	+3.0	78	16	64	29	9	42	37	-----	-----	---	1.31	-1.9	7	6.4	sw.	26	sw.	8	18	8	4	3.1	.0	.0
Augusta [2]	182	62	77	29.91	30.11	-.02	56.1	+1.6	79	16	68	30	26	44	39	47	41	66	.57	-1.8	2	5.1	nw.	19	w.	6	16	7	7	3.7	.0	.0
Savannah [2]	65	73	152	30.03	30.10	-.02	61.8	+3.3	82	1	72	36	26	51	30	52	48	80	1.82	-.3	6	9.2	ne.	25	n.	15	14	7	9	4.3	.0	.0
Jacksonville [2]	43	86	110	30.04	30.09	-.01	63.6	+1.4	86	1	72	40	10	55	28	56	54	86	3.57	+1.6	7	7.2	ne.	24	ne.	14	8	11	11	5.5	.0	.0
Florida Peninsula							**75.4**	**+2.4**										**84**	**5.67**	**+3.4**										**5.8**		
Key West [2]	21	10	64	29.99	30.01	-.01	76.3	+2.0	88	1	81	68	10	71	15	71	69	83	7.59	+5.4	10	9.3	ne.	27	s.	6	10	10	10	5.3	.0	.0
Miami [2]	25	124	168	29.98	30.01	-.05	74.6	+2.8	85	1	80	58	10	69	18	67	66	87	4.66	+1.8	15	10.5	e.	27	sw.	5	6	11	13	6.5	.0	.0
Tampa [1]	35	5	61	30.01	30.05	-.03	69.2	-----	85	23	77	47	10	61	26	63	60	83	4.75	+3.0	9	10.3	ne.	30	s.	6	9	10	11	5.5	.0	.0
East Gulf States							**56.6**	**-0.4**										**78**	**2.61**	**-0.7**										**4.5**		
Atlanta [1]	1,173	5	72	28.87	30.12	-.01	52.6	-----	75	16	63	29	12	42	36	44	39	70	1.79	-----	6	8.6	nw.	30	w.	1	17	5	8	4.0	T	.0
Macon [2]	370	79	87	29.71	30.11	-.02	55.0	+.8	78	1	68	29	12	42	37	47	42	70	1.47	-1.0	6	6.3	n.	20	nw.	24	11	13	6	4.5	.0	.0
Thomasville	273	49	58	29.82	30.13	+.01	59.0	+.5	85	17	71	33	26	47	38	-----	-----	---	.45	-----	5	-----	s.	-----	-----	---	11	8	11	----	.0	.0
Apalachicola	35	11	-----	30.04	30.08	-----	61.8	+.5	84	1	69	41	26	54	24	56	53	80	4.31	+1.2	9	8.9	n.	26	n.	24	13	8	9	4.8	.0	.0
Pensacola	56	54	79	30.04	30.10	-.01	59.2	-1.0	78	20	69	32	9	50	29	52	48	73	2.29	-1.4	7	7.8	ne.	20	se.	4	12	11	7	4.6	.0	.0
Anniston	741	9	-----	-----	-----	-----	52.0	+.1	76	17	64	24	12	40	42	-----	-----	---	2.57	-----	5	-----	nw.	-----	-----	---	10	13	7	----	.0	.0
Birmingham [2]	700	11	48	29.39	30.14	+.02	53.6	-.3	77	18	64	28	25	43	34	43	41	81	1.67	-1.6	5	6.2	n.	27	se.	22	13	7	10	4.7	T	.0
Mobile [2]	57	86	161	30.05	30.11	.00	58.0	-.6	78	19	68	33	9	47	30	51	47	78	3.72	+.1	7	9.6	n.	26	n.	24	11	10	9	5.0	.0	.0
Montgomery [2]	218	92	105	29.89	30.12	.00	56.6	+.8	78	19	67	33	9	46	31	48	44	76	1.34	-1.9	6	6.4	n.	18	nw.	23	18	6	6	3.7	.0	.0
Meridian [2]	375	67	92	29.73	30.14	+.02	52.8	-1.4	78	18	65	28	26	40	38	45	43	86	1.79	-1.5	10	4.8	n.	17	s.	22	14	6	10	4.6	.0	.0
Vicksburg [2]	247	82	102	29.86	30.13	+.01	54.4	-2.2	78	18	64	31	25	45	29	43	41	88	5.13	+1.4	8	7.2	n.	19	nw.	8	12	7	11	4.8	.0	.0
New Orleans [2]	53	76	84	30.05	30.11	+.01	60.2	-1.4	80	19	68	3[illegible]	25	52	22	54	50	75	1.73	-1.4	10	7.1	ne.	19	n.	24	14	7	9	4.5	.0	.0
West Gulf States							**56.8**	**-0.9**										**78**	**1.69**	**-1.1**										**4.8**		
Shreveport [2]	249	92	227	-----	30.14	+.03	53.6	-2.4	82	16	65	28	25	42	-----	-----	-----	---	4.10	+.4	5	9.8	se.	31	nw.	7	11	13	6	----	.0	.0
Bentonville	1,303	12	51	28.70	30.09	-.02	47.4	+.7	78	16	58	20	10	37	36	-----	-----	---	2.80	-.2	8	6.8	s.	21	s.	18	13	11	6	5.1	T	.0
Fort Smith	463	57	82	-----	30.10	-.01	50.8	-.2	83	16	61	26	24	41	-----	-----	-----	---	2.35	-.5	6	6.6	e.	23	nw.	7	16	7	7	----	.0	.0
Little Rock [2]	357	94	102	29.74	30.13	+.01	51.2	-.9	80	16	61	28	25	42	30	44	40	80	1.29	-2.9	6	7.1	w.	24	nw.	5	12	10	8	4.6	.0	.0
Austin [2]	605	68	90	-----	30.11	-----	58.1	-.4	84	3	70	29	25	47	-----	-----	-----	---	1.24	-1.1	4	5.6	n.	21	n.	5	9	11	10	----	.0	.0
Brownsville [2]	57	88	96	30.00	30.06	-----	67.4	+.2	86	3	75	46	24	60	29	61	59	83	1.38	-.6	6	9.2	n.	25	n.	23	4	13	13	6.2	.0	.0
Corpus Christi [2]	20	11	78	30.07	30.09	+.02	64.2	-.1	82	3	71	42	24	57	25	57	55	85	.79	-1.2	4	9.4	n.	27	n.	5	12	7	11	5.0	.0	.0
Dallas [1]	512	6	46	29.57	30.12	-----	55.2	-----	82	16	68	24	24	43	39	47	43	73	.67	-1.9	4	9.4	se.	31	s.	17	13	9	8	4.7	.0	.0
Fort Worth [1]	679	35	56	29.39	30.12	+.02	55.2	-----	84	16	67	27	24	43	37	48	44	75	1.08	-1.4	6	9.6	s.	31	n.	5	12	10	8	4.7	.0	.0
Galveston [2]	54	106	114	30.05	30.11	+.02	60.6	-2.7	77	3	66	41	24	55	17	55	52	79	1.52	-1.8	6	8.8	n.	36	n.	5	14	8	8	4.7	.0	.0
Houston [2]	138	159	190	29.97	30.13	-----	59.8	-1.2	83	3	69	36	24	51	27	51	48	81	1.71	-2.1	9	9.2	se.	31	nw.	5	15	6	9	4.3	.0	.0
Palestine	510	64	72	29.60	30.14	+.03	55.4	-1.8	80	15	66	29	24	45	31	48	43	70	4.03	+.6	4	6.6	s.	21	n.	5	13	10	7	4.1	.0	.0
Port Arthur	34	59	134	30.08	30.12	-----	58.6	-----	76	17	67	38	24	50	26	52	48	75	2.65	-.4	10	11.4	ne.	34	n.	5	14	10	6	4.1	.0	.0
San Antonio [1]	693	28	59	29.37	30.11	+.03	59.1	-----	83	3	72	31	25	47	30	52	49	77	.47	-1.4	6	7.0	ne.	27	ne.	5	12	5	13	5.3	.0	.0
Ohio Valley and Tennessee							**46.0**	**+1.7**										**78**	**2.13**	**-1.0**										**5.4**		
Chattanooga [1]	762	21	54	29.31	30.14	0.00	47.8	-----	75	17	61	24	25	35	42	40	37	81	2.80	-----	6	5.2	s.	28	w.	1	13	5	12	5.1	T	.0
Knoxville [2]	995	66	84	29.06	30.14	+.01	48.0	+.1	74	17	59	26	12	37	35	40	37	77	2.55	-.5	6	4.8	ne.	19	w.	7	15	3	12	4.6	T	.0
Memphis [2]	399	78	86	29.69	30.13	+.01	49.0	-2.7	78	16	60	25	25	38	38	42	39	81	1.69	-2.6	7	6.7	s.	21	n.	20	15	4	11	4.9	.0	.0
Nashville [1]	546	5	72	29.54	30.13	+.01	47.9	-----	77	17	60	23	12	36	41	41	37	76	2.81	-.7	7	6.9	s.	30	w.	1	11	5	14	5.5	T	.0
Lexington	989	6	-----	29.04	30.13	+.01	46.2	+1.4	79	17	57	20	25	35	36	-----	-----	---	3.17	-.2	11	-----	s.	-----	-----	---	12	4	14	5.2	.3	.0
Louisville [2]	525	106	120	29.53	30.10	-.02	47.6	+.9	75	17	56	26	25	39	31	40	35	76	1.84	-1.8	8	8.4	sw.	30	sw.	1	12	6	12	5.3	T	.0
Evansville [1]	431	5	38	29.62	30.10	-.02	45.1	-----	75	17	55	24	25	35	38	39	36	79	2.22	-1.5	7	7.0	sw.	26	w.	1	12	4	14	5.4	T	.0
Indianapolis [2]	823	98	129	29.16	30.06	-.04	45.6	+3.3	73	18	53	22	24	38	32	38	35	83	2.22	-1.1	9	8.1	sw.	25	sw.	1	11	5	14	5.8	1.5	.0
Terre Haute [2]	575	68	149	29.45	30.08	-----	45.9	-----	73	17	54	20	24	38	32	38	36	83	3.19	-.1	10	9.6	sw.	30	sw.	1	12	6	12	5.3	7.7	.0
Cincinnati [2]	627	11	51	29.40	30.10	-.02	46.2	+3.7	72	18	55	23	24	38	33	39	36	81	1.53	-1.3	9	7.9	sw.	26	sw.	1	13	3	14	5.4	T	.0
Columbus [2]	822	90	110	29.18	30.07	-.04	45.1	+3.2	70	18	53	24	25	37	30	38	34	77	1.31	-1.5	7	10.8	s.	36	sw.	1	10	6	14	6.0	.3	.0

See footnotes at end of table.

CLIMATOLOGICAL DATA FOR WEATHER BUREAU STATIONS—Continued

District and station	Elevation of instruments: Barometer above sea level	Elevation of instruments: Thermometer above ground	Elevation of instruments: Anemometer above ground	Pressure: Station, reduced to mean of 24 hours	Pressure: Sea level, reduced to mean of 24 hours	Pressure: Departure from normal	Temperature of the air: Mean max.+mean min.÷2	Temperature of the air: Departure from normal	Temperature of the air: Maximum	Temperature of the air: Date	Temperature of the air: Mean maximum	Temperature of the air: Minimum	Temperature of the air: Date	Temperature of the air: Mean minimum	Temperature of the air: Greatest daily range	Mean wet thermometer	Mean temperature of the dew-point	Mean relative humidity	Precipitation: Total	Precipitation: Departure from normal	Precipitation: Days with 0.01, or more	Wind: Average hourly velocity	Wind: Prevailing direction	Wind: Maximum velocity: Miles per hour	Wind: Maximum velocity: Direction	Wind: Maximum velocity: Date	Clear days	Partly cloudy days	Cloudy days	Average cloudiness, tenths	Total snowfall	Snow, sleet, and ice on ground at end of month
Ohio Valley and Tennessee—Con.	Ft.	Ft.	Ft.	In.	In.	In.	° F.	° F.	° F.		° F.	° F.		° F.	° F.	° F.	° F.	%	In.	In.		Miles								0–10	In.	In.
Dayton [2]	900	186	213	29.10	30.08	-----	45.0	+3.0	70	17	52	22	24	37	32	38	35	80	1.61	−1.2	10	11.4	sw.	34	sw.	1	11	5	14	5.5	T	.0
Elkins [2]	1,947	61	78	28.04	30.14	+.02	42.2	+1.9	74	17	55	14	25	29	48	33	29	74	1.80	−1.0	7	5.8	w.	21	w.	7	10	5	15	5.7	T	.0
Parkersburg	637	77	84	29.40	30.10	−.02	45.6	+1.8	74	18	56	20	25	35	37	39	34	72	1.58	−1.0	7	5.4	se.	18	w.	20	12	9	9	4.9	.1	.0
Pittsburgh [1]	842	39	54	29.15	30.07	−.03	44.7	-----	71	19	53	22	25	36	32	38	32	68	2.27	.0	7	11.7	sw.	36	sw.	1	10	7	13	5.8	T	.0
Lower Lake Region							43.0	+3.9										77	1.93	−0.8										7.3		
Buffalo [2]	768	243	180	29.14	29.98	−.07	43.8	+4.4	67	19	49	28	17	39	26	38	34	75	3.06	.0	8	21.0	w.	52	sw.	7	3	8	19	7.6	5.0	.0
Canton	448	10	61	29.47	29.95	-----	38.2	+4.3	68	19	46	14	30	30	36	35	32	79	2.51	−.6	13	10.1	sw.	29	w.	21	2	5	23	8.5	.9	.0
Ithaca	836	77	100	-----	-----	-----	43.6	+5.0	72	19	52	22	17	36	28	-----	-----	---	1.78	−.6	11	9.4	sw.	30	se.	1	3	8	19	7.5	.6	.0
Oswego	335	71	85	29.61	29.98	−.07	43.2	+4.3	72	19	50	23	17	37	31	39	34	71	2.61	−.8	16	10.9	s.	30	se.	1	3	8	19	7.8	.6	.0
Rochester [1]	523	5	69	29.41	29.99	−.06	43.1	-----	73	19	50	23	17	36	32	38	34	78	1.05	−1.5	9	12.1	sw.	38	w.	26	3	8	19	7.5	.2	.0
Syracuse [1]	596	5	51	29.33	29.99	−.07	43.3	-----	73	19	51	20	17	35	41	39	34	73	1.93	−.8	9	11.5	sw.	36	w.	21	3	6	21	7.8	.5	.0
Erie [2]	714	57	81	29.23	30.01	−.05	45.4	+4.0	71	18	51	27	25	40	24	39	36	78	2.10	−1.2	9	10.6	sw.	25	sw.	7	2	4	24	8.3	2.3	.0
Cleveland [1]	762	27	54	29.19	30.03	−.04	43.2	-----	70	18	51	22	25	36	31	38	34	77	1.11	−1.5	9	12.6	sw.	34	sw.	7	7	5	18	6.9	.5	.0
Sandusky	629	5	67	-----	-----	-----	44.0	+2.9	71	18	51	23	25	37	31	-----	-----	---	1.34	−1.0	8	10.9	sw.	27	sw.	7	7	5	18	6.6	.1	.0
Toledo [2]	628	79	87	29.32	30.01	−.06	42.8	+2.4	70	19	50	23	25	36	28	38	34	80	1.63	−.8	9	11.5	w.	30	w.	2	7	10	13	6.1	1.1	.0
Fort Wayne [1]	857	69	84	29.09	30.03	-----	41.4	-----	70	19	50	19	24	33	34	37	35	86	2.25	−.6	10	10.2	w.	31	sw.	1	8	10	12	6.0	.5	.0
Detroit [1]	730	5	78	29.19	30.00	−.06	43.0	-----	69	18	50	24	25	36	24	38	34	77	1.78	−.7	10	12.9	sw.	31	sw.	1	7	8	15	6.6	.5	.0
Upper Lake Region							38.1	+3.3										80	2.09	−0.3										7.4		
Alpena	609	5	89	29.23	29.91	−.10	39.0	+4.6	66	19	45	22	24	33	28	36	33	83	3.74	+1.1	11	10.7	sw.	32	e.	1	1	10	19	7.8	8.7	.0
Escanaba	612	1	72	-----	29.93	−.10	36.4	+3.3	60	15	42	11	24	30	-----	-----	-----	78	1.20	−.9	5	11.6	nw.	40	ne.	1	1	10	19	-----	1.1	.0
Grand Rapids [2]	707	70	244	29.17	29.95	−.10	42.7	+4.3	71	19	48	26	24	37	29	37	34	82	3.18	+.4	13	13.5	sw.	36	sw.	1	6	8	16	6.9	5.4	.0
Lansing [2]	878	5	90	29.01	29.97	-----	41.2	+3.7	69	19	48	22	25	34	28	37	34	82	2.97	+.5	13	10.3	sw.	26	sw.	1	4	11	15	6.7	1.7	.0
Marquette	734	44	73	29.09	29.91	−.11	35.6	+2.3	65	19	41	12	24	31	27	33	30	81	2.96	.0	14	9.1	w.	31	sw.	25	2	8	20	7.9	15.3	.0
Sault Sainte Marie [2]	614	11	52	29.21	29.89	−.12	34.4	+2.4	64	19	39	14	30	29	21	32	29	84	2.46	−1.0	15	11.2	nw.	38	nw.	26	2	4	24	8.7	13.7	.3
Chicago	673	7	131	29.27	30.01	−.06	43.2	+3.1	70	17	49	17	24	37	27	39	35	78	2.07	−.3	10	12.0	w.	28	sw.	1	7	8	15	6.5	5.2	.0
Green Bay	617	109	141	29.26	29.94	−.10	38.4	+4.4	66	18	45	15	24	32	25	35	31	76	1.02	−1.1	6	12.3	sw.	31	ne.	1	6	6	18	7.1	4.8	.0
Milwaukee [1]	681	33	66	29.22	29.98	−.07	40.0	-----	67	18	47	12	24	33	29	36	33	80	.93	−.8	9	14.8	sw.	34	w.	20	6	5	19	7.0	3.1	.0
Duluth	1,133	5	47	28.70	29.96	−.08	31.6	+1.6	53	15	38	0	23	25	26	27	25	83	.34	−1.1	6	13.8	w.	34	w.	25	3	7	20	8.1	.2	.0
North Dakota							30.5	+4.2										81	0.38	−0.3										6.5		
Moorhead, Minn. [2]	940	50	58	28.94	29.99	−.08	31.4	+4.3	60	12	39	4	23	24	31	28	25	81	.09	−.8	4	8.8	n.	27	nw.	25	8	4	18	6.9	1.0	.0
Bismarck [1]	1,677	4	41	28.18	30.02	−.05	32.5	-----	62	14	42	3	22	24	39	29	25	79	.31	−.2	7	10.6	nw.	36	nw.	14	12	1	17	6.4	3.3	.0
Devils Lake	1,478	11	44	28.36	29.99	−.07	27.9	+3.4	55	14	35	−1	23	21	27	26	24	88	.41	−.3	10	9.4	w.	26	nw.	3	6	7	17	6.9	3.6	T
Lemmon, S. Dak	2,602	4	38	27.23	30.02	-----	34.2	-----	65	11	45	−3	22	24	43	29	26	---	.14	-----	2	-----	w.	---	-----	---	9	8	13	-----	.5	.0
Grand Forks	832	11	71	29.06	30.00	-----	28.9	-----	50	3	37	−3	22	21	29	26	24	---	.18	-----	6	-----	-----	---	-----	---	---	---	---	-----	-----	-----
Williston	1,878	42	50	27.97	30.00	−.06	32.1	+4.9	61	14	40	−7	22	24	30	29	25	77	.70	+.1	9	8.2	w.	33	w.	14	8	8	14	5.9	7.0	T
Upper Mississippi Valley							42.8	+3.6										78	1.54	−0.5										6.1		
Minneapolis-St. Paul, Minn. [1]	919	32	61	28.96	29.97	−.09	36.5	-----	68	18	45	7	23	28	30	32	27	72	1.05	−.2	5	10.6	nw.	26	n.	7	5	7	18	7.3	3.8	.0
Springfield, Minn	1,025	4	42	28.86	29.99	-----	36.0	-----	68	18	45	8	23	27	34	32	28	---	1.06	-----	4	-----	nw.	---	-----	---	8	7	15	-----	2.3	.0
La Crosse [2]	714	11	48	29.19	29.98	−.09	39.6	+4.4	68	18	47	14	23	32	34	34	30	77	1.26	−.3	3	6.4	s.	17	w.	25	9	4	17	6.8	T	.0
Madison [2]	974	70	78	28.92	29.98	−.08	39.2	+4.0	68	17	46	16	24	32	31	35	31	79	.53	−1.2	5	10.2	sw.	25	ne.	6	8	6	16	6.7	.5	.0
Charles City	1,015	10	51	28.90	30.02	−.06	37.6	+4.6	73	17	47	11	24	28	33	34	31	81	1.01	−.5	4	7.2	w.	22	sw.	18	9	5	16	6.4	.8	.0
Davenport [2]	606	66	161	29.36	30.03	−.06	42.6	+3.6	73	17	50	16	24	35	29	38	35	83	1.36	−.5	5	10.2	w.	27	w.	1	9	4	17	6.4	1.6	.0
Des Moines [2]	860	5	99	29.08	30.02	−.06	42.0	+3.6	76	17	51	16	23	33	33	36	33	77	1.31	−.1	5	10.1	sw.	25	sw.	18	9	8	13	5.7	T	.0
Dubuque	699	60	79	29.24	30.00	−.06	41.8	+4.8	71	17	50	18	24	34	29	37	32	72	.80	−.9	4	6.7	nw.	18	nw.	19	9	2	19	6.9	T	.0
Keokuk	614	64	78	29.38	30.05	−.04	44.6	+3.5	75	17	53	17	23	37	30	-----	-----	---	1.32	−.6	4	8.4	sw.	26	sw.	19	11	5	14	5.7	1.1	.0
Cairo	358	87	93	29.72	30.12	−.04	48.0	+.7	76	17	56	27	25	40	30	-----	-----	---	1.42	−2.3	6	6.9	s.	25	sw.	1	12	6	12	5.5	T	.0
Peoria [2]	609	11	45	29.37	30.03	−.06	43.3	+5.8	75	17	52	15	24	35	28	38	36	84	2.02	−.4	5	6.7	s.	19	w.	1	15	3	12	4.9	3.5	.0
Springfield, Ill. [2]	636	5	191	29.36	30.06	−.04	44.8	+2.6	74	17	52	15	24	37	25	37	35	85	3.37	+.8	7	11.6	nw.	32	sw.	1	10	6	14	5.9	4.8	.0
St. Louis [4]	568	179	303	29.46	30.06	−.02	47.2	+1.8	77	17	55	23	24	40	26	41	36	60	3.05	+.2	8	11.4	sw.	34	sw.	10	14	4	12	4.9	3.0	.0
Missouri Valley							43.2	+3.0										78	1.11	−0.4										5.5		
Columbia, Mo. [2]	784	6	66	29.22	30.08	−.01	45.7	+2.4	78	17	54	20	24	37	31	40	36	78	2.44	+.2	6	7.3	s.	20	nw.	6	12	7	11	5.1	3.5	.0
Kansas City [1]	963	38	76	29.02	30.07	−.02	46.2	-----	77	16	55	21	24	37	35	40	36	73	.94	−.9	8	11.4	sw.	31	nw.	7	12	4	14	5.4	2.0	.0
St. Joseph [2]	967	11	49	29.01	30.06	-----	44.7	+3.2	74	16	53	20	24	36	33	38	36	87	.96	−.7	6	8.8	s.	24	w.	20	11	5	14	5.8	3.1	.0
Springfield, Mo. [1]	1,324	5	60	28.68	30.10	.00	45.0	-----	76	16	55	17	24	35	34	39	36	79	2.50	−.3	8	10.2	s.	30	s.	19	12	5	13	5.2	2.3	.0
Topeka	987	65	87	29.00	30.07	-----	45.7	+2.9	75	16	56	20	24	36	32	40	36	76	.65	−.9	6	9.2	s.	27	n.	5	13	3	14	5.3	1.9	.0
Lincoln [2]	1,189	11	81	28.75	30.05	−.03	41.8	+2.7	75	17	52	16	23	32	37	36	33	83	.94	−.1	4	9.8	s.	27	s.	18	11	6	13	5.4	3.5	.0
Omaha [1]	1,105	31	44	28.84	30.04	−.04	40.3	-----	73	18	50	16	23	31	36	36	33	80	1.01	−.1	5	11.2	se.	37	nw.	5	11	7	12	5.7	2.5	.0
Valentine	2,598	46	54	27.28	30.05	−.03	38.2	+3.6	82	16	51	−6	23	25	46	31	26	69	.45	−.1	7	8.3	w.	27	nw.	6	12	9	9	5.2	2.9	.0
Sioux City [1]	1,138	5	27	28.79	30.03	−.05	38.6	-----	73	18	50	9	23	27	39	34	30	79	1.73	-----	5	9.3	nw.	30	s.	18	9	7	14	6.3	.3	.0
Huron [1]	1,301	26	41	28.59	30.02	−.06	35.6	-----	67	12	45	6	23	26	37	31	27	77	.09	−.5	4	11.6	n.	34	s.	14	9	9	12	5.9	.4	.0
Northern Slope							37.5	+4.7										70	0.74	0.0										6.2		
Billings [1]	3,570	18	39	26.32	30.04	-----	39.8	-----	65	11	49	−4	22	31	33	33	26	61	1.20	-----	8	13.6	sw.	45	nw.	14	7	10	13	6.3	7.4	.0
Havre	2,507	11	67	27.33	30.01	−.02	36.6	+5.4	70	11	48	−9	22	25	42	32	26	68	.97	+.4	5	10.2	sw.	35	sw.	24	6	5	19	7.0	5.0	.0
Helena [1]	4,124	5	35	25.84	30.14	+.04	35.6	-----	61	9	47	−4	22	24	33	31	26	73	.40	−.3	6	8.0	w.	40	s.	13	4	8	18	7.1	1.9	.0
Missoula [2]	3,205	80	91	26.71	30.17	-----	36.6	+4.1	58	5	45	8	22	28	35	32	29	85	1.55	+.3	11	5.5	se.	31	nw.	13	4	8	18	7.3	.7	.0
Kalispell	2,973	48	56	26.98	30.10	+.03	36.2	+3.8	57	5	44	6	22	28	26	34	31	83	1.68	+.3	14	4.9	w.	24	sw.	3	4	6	20	7.7	4.3	.0
Miles City [2]	2,371	48	55	27.50	30.04	−.03	36.7	+5.8	64	11	47	−9	22	26	36	31	27	75	.48	−.1	5	6.5	s.	36	nw.	4	9	8	13	6.1	3.5	.0
Rapid City [2]	3,259	50	58	26.62	30.05	−.03	40.1	+4.2	66	11	52	4	22	28	41	31	24	63	.08	−.4	4	7.6	w.	27	nw.	19	10	12	8	5.2	.6	.0
Cheyenne [1]	6,094	5	39	24.01	30.08	+.01	38.2	-----	69	16	51	−7	22	26	41	30	20	52	.71	+.2	4	12.6	nw.	43	nw.	25	7	15	8	5.7	7.3	.0
Lander	5,352	60	68	24.69	30.12	+.02	35.0	+4.7	68	15	47	−7	23	23	37	30	23	65	.86	+.3	7	4.3	sw.	24	w.	15	10	11	9	5.0	6.3	.1
Sheridan [6]	3,790	6	42	26.10	30.06	-----	38.0	+5.3	68	14	50	−5	22	25	41	31	25	69	.48	−.2	5	9.0	nw.	40	nw.	19	7	11	12	5.8	5.5	.0
North Platte [2]	2,821	11	51	27.07	30.06	−.02	41.0	+4.4	80	16	56	3	23	26	49	31	26	72	.23	−.2	4	7.2	w.	27	n.	7	13	10	7	4.5	.2	.0
Middle Slope							46.5	+2.2										70	0.83	−0.2										4.2		
Denver [1]	5,292	106	113	24.76	30.06	.00	44.3	-----	77	16	56	10	22	32	35	33	23	52	.79	+.2	4	7.4	s.	32	ne.	4	17	10	3	3.8	4.2	.0
Pueblo [1]	4,690	5	36	25.32	30.08	+.03	42.1	-----	78	14	60	3	23	24	54	32	23	58	.23	−.1	2	7.4	w.	34	w.	25	15	12	3	3.7	2.8	.0
Concordia	1,392	50	58	28.56	30.07	−.01	43.8	+2.4	72	17	54	15	23	34	34	39	35	79	.83	−.2	6	7.9	sw.	26	s.	18	14	7	9	4.6	4.0	.0
Dodge City	2,509	10	86	27.43	30.07	.00	45.5	+2.9	78	15	59	10	23	32	40	38	34	73	.87	+.1	6	9.9	s.	31	s.	18	15	8	7	4.4	5.3	.0
Wichita [1]	1,358	6	64	28.62	30.08	.00	45.4	-----	72	17	56	20	23	35	32	40	38	84	.78	−.6	5	13.4	s.	37	s.	17	13	5	12	4.8	.2	.0
Oklahoma City [2]	1,214	10	47	28.81	30.11	+.03	50.2	+1.4	82	16	60	27	24	40	34	44	40	77	1.49	−.4	6	8.6	s.	24	nw.	7	12	13	5	4.1	T	.0

See footnotes at end of table.

CLIMATOLOGICAL DATA FOR WEATHER BUREAU STATIONS—Continued

District and station	Elevation of instruments: Barometer above sea level	Elevation of instruments: Thermometer above ground	Elevation of instruments: Anemometer above ground	Pressure: Station, reduced to mean of 24 hours	Pressure: Sea level, reduced to mean of 24 hours	Pressure: Departure from normal	Temperature: Mean max.+mean min.÷2	Temperature: Departure from normal	Temperature: Maximum	Temperature: Date	Temperature: Mean maximum	Temperature: Minimum	Temperature: Date	Temperature: Mean minimum	Temperature: Greatest daily range	Mean wet thermometer	Mean temperature of the dew-point	Mean relative humidity	Precipitation: Total	Precipitation: Departure from normal	Precipitation: Days with 0.01, or more	Wind: Average hourly velocity	Wind: Prevailing direction	Wind: Maximum velocity: Miles per hour	Wind: Maximum velocity: Direction	Wind: Maximum velocity: Date	Clear days	Partly cloudy days	Cloudy days	Average cloudiness, tenths	Total snowfall	Snow, sleet, and ice on ground at end of month
	Ft.	Ft.	Ft.	In.	In.	In.	° F.	° F.	° F.		° F.	° F.		° F.	° F.	° F.	° F.	%	In.	In.		Miles								0-10	In.	In.
Southern Slope							53.0	+1.2										71	0.29	−0.8										4.0		
Abilene [2]	1,738	10	56	28.27	30.09	+.02	55.3	+1.8	81	16	67	27	24	44	36	46	43	76	.50	−.8	4	8.4	s.	26	s.	18	12	9	9	4.7	0.0	0.0
Amarillo [2]	3,676	10	49	26.32	30.08	+.03	47.6	+2.1	76	16	62	14	23	34	38	39	35	73	.33	−.6	2	12.4	sw.	44	ne.	4	19	8	3	2.7	3.1	.0
Del Rio	960	63	71	29.07	30.06	+.01	59.4	−.6	81	3	69	36	25	50	33	53	47	70	.22	−1.0	5	7.0	se.	22	nw.	5	9	10	11	5.7	.0	.0
Roswell	3,566	75	85	26.44	30.08	+.05	49.8	+1.7	77	2	65	19	23	35	42	42	35	65	.11	−.7	1	6.0	s.	32	ne.	4	20	6	4	2.9	.0	.0
Southern Plateau							57.6	+2.1										52	0.53	0.0										2.9		
El Paso [2]	3,778	82	101	26.24	30.05	+.05	53.3	+.6	75	4	65	30	26	42	33	44	36	61	.48	.0	3	6.6	w.	22	sw.	18	18	5	7	3.6	.0	.0
Albuquerque [1]	5,314	5	45	24.80	30.07		45.5		68	15	59	20	23	32	34	37	28	57	.37	−.1	3	7.1	n.	37	s.	17	18	9	3	3.2	.4	.0
Phoenix [2]	1,107	39	87	28.82	29.98	.00	62.1	+2.4	89	5	77	32	20	47	38	49	40	55	1.26	+.6	3	4.6	e.	22	w.	12	17	10	3	2.9	.0	.0
Tucson [1]	2,555	5	23	27.36	29.97		60.6		85	12	76	30	20	46	39	47	34	44	.65	−.2	2		se.				18	8	4	3.2	.0	.0
Yuma	142	9	54	29.85	30.00	+.02	65.2	+2.8	91	7	79	36	22	52	35	51	38	43	.37	+.1	1	6.3	n.	26	n.	21	23	6	1	1.6	.0	.0
Independence	3,957	5	26	26.06	30.13	+.08	49.8	+2.6	81	5	65	20	23	35	38	38	23		.03	−.3	1		nw.				19	5	6		.0	.0
Middle Plateau							41.5	+2.2										68	0.84	+0.1										4.4		
Reno [2]	4,527	61	76	25.56	30.16	+.05	44.1	+2.6	70	10	57	17	21	31	37	35	30	69	.32	−.3	4	3.7	w.	24	w.	16	14	10	6	4.0	T	.0
Tonopah	6,090	12	20	24.13	30.13		43.6		65	14	52	16	20	35	23	36	29		.14		2		se.				14	10	6		2.0	.0
Winnemucca	4,339	5	56	25.74	30.18	+.04	41.8	+3.4	70	15	55	12	23	28	41	35	29	67	1.24	+.6	8	7.1	ne.	25	sw.	14	11	6	13	5.3	T	.0
Modena	5,473	10	46				38.8	+2.4	71	15	54	5	23	24	41				.24	−.4	3	8.4	w.	35	sw.	17	17	4	9	4.0	.2	.0
Salt Lake City [2]	4,357	86	210	25.73	30.20	+.08	41.9	+.8	72	15	51	16	23	33	29	35	30	75	2.16	+.8	4	6.8	se.	27	s.	16	15	6	9	4.4	15.2	T
Grand Junction	4,602	60	68	25.50	30.14	+.06	41.0	+1.7	64	17	53	16	23	29	32	34	26	60	.26	−.3	6	4.8	nw.	34	sw.	17	14	11	5	4.1	2.2	.0
Northern Plateau							42.7	+3.4										78	1.31	−0.2										6.9		
Baker [2]	3,471	36	54	26.54	30.17	+.01	39.0	+3.0	61	9	49	15	22	29	32	34	31	81	.75	−.3	6	6.1	s.	27	sw.	13	6	7	17	7.0	.1	.0
Boise [1]	2,739	5	49	27.29	30.17	.00	42.0		68	15	52	16	22	32	35	38	33	74	.77		8	8.5	se.	36	w.	15	8	10	12	5.9	.0	.0
Pocatello [1]	4,478	5	31	25.58	30.20	+.06	34.1		68	15	46	−1	23	23	42	30	27	79	2.05		9	6.9	sw.	29	sw.	15	10	7	13	6.2	7.5	2.0
Spokane [1]	1,929	27	42	28.04	30.11	+.01	40.2		58	5	49	20	23	32	25	38	36	82	1.63	−.5	9	5.4	ne.	26	se.	13	3	6	21	7.8	1.8	.0
Walla Walla	991	57	65	29.02	30.10	−.03	46.0	+3.2	67	13	54	27	23	38	34				1.98	.0	8	4.6	s.	23	se.	13	5	6	19	7.5	T	.0
Yakima	1,076	58	67	28.94	30.10		43.0	+4.1	62	5	52	23	22	34	37	39	35	74	.89	.0	11	3.7	nw.	26	nw.	3	6	7	17	6.9	T	.0
North Pacific Coast Region							49.5	+3.4										83	5.52	−0.9										8.0		
North Head	211	5	56	29.79	30.02	−.03	50.7	+2.5	69	7	55	38	27	46	20	48	45	83	6.75	−1.7	18	13.4	se.	59	s.	13	1	4	25	8.3	.0	.0
Seattle [2]	125	90	321	29.92	30.05	+.01	49.1	+3.5	63	8	54	34	22	44	18	46	44	86	5.56	+.5	15	8.4	se.	40	s.	24	2	9	19	7.8	.0	.0
Tacoma	194	172	201	29.84	30.05	+.01	48.0	+3.4	65	5	54	30	22	42	19				4.51	−1.8	13	6.8	s.	38	s.	24	0	6	24	8.7	.0	.0
Tatoosh Island	86	9	61	29.90	30.00	+.03	49.8	+3.9	65	29	54	42	16	46	16	47	44	80	8.45	−3.5	19	17.0	e.	59	s.	29	5	5	20	7.7	.0	.0
Medford [1]	1,329	29	58	28.68	30.10		47.8		74	7	58	21	26	38	34	44	41	79	2.65	+.2	8		s.				5	10	15	7.0	.0	.0
Portland, Oreg. [2]	154	68	106	29.90	30.07	−.03	49.4	+2.6	68	8	55	30	22	44	22	46	44	86	4.62	−1.5	14	5.0	se.	22	w.	13	1	6	23	8.4	.0	.0
Roseburg	510	45	76	29.52	30.08	−.04	50.2	+4.3	71	5	57	28	25	43	28	48	45	85	6.09	+1.4	11	3.2	s.	21	sw.	13	1	8	21	8.4	.0	.0
Middle Pacific Coast Region							56.2	+2.5										72	2.54	−0.9										6.0		
Eureka	60	72	88	30.02	30.09	−.02	54.6	+3.5	70	29	61	35	20	48	24	51	48	81	3.91	−1.3	9	5.5	se.	25	s.	13	4	9	17	7.0	.0	.0
Redding [1]	722	20	34	29.31	30.09		56.6		84	5	65	36	18	48	28	49	41	61	3.10	−1.3	10	6.9	nw.	20	nw.	15	9	6	15	6.3	.0	.0
Sacramento [2]	66	92	115	30.01	30.08	−.01	55.6	+2.0	78	7	65	32	21	46	29	50	46	74	1.17	−.7	6	5.6	n.	18	nw.	20	11	9	10	5.1	.0	.0
San Francisco	155	112	132	29.90	30.07	−.02	58.4	+2.1	78	7	64	46	21	53	21	53	49	74	1.99	−.4	8	5.3	w.	24	se.	29	9	9	12	5.8	.0	.0
South Pacific Coast Region							61.3											62	0.95	0.0										3.8		
Fresno [1]	327	5	35	29.73	30.08	+.02	55.0		82	7	67	28	20	43	36	49	43	67	.56	−.4	2	3.6	nw.	18	w.	16	10	10	10	5.0	.0	.0
Los Angeles	338	223	250	29.65	30.01	−.01	65.4	+4.5	90	5	76	44	19	55	31	53	40	48	.05	−1.2	2	6.7	ne.	21	n.	20	20	8	2	2.5	.0	.0
San Diego [1]	87	20	55	29.91	30.01	−.01	63.4		90	5	75	40	21	52	32	56	50	70	2.23	+1.5	3	5.3	n.	24	ne.	12	18	5	7	4.0	.0	.0
West Indies																																
San Juan, P. R.	82	10	54																													
Panama Canal																																
Balboa Heights	118	6	92		[3] 29.81	−.01	80.2	+1.1	90	19	87	71	4	73	18			[3] 88	7.53	−2.8	17	5.5	nw.	23	n.	25	0	17	13	7.2	.0	.0
Cristobal	36	6	97		[3] 29.82	−.01	80.8	+1.5	90	3	85	74	11	76	14	76	75	[3] 86	24.07	+1.7	23	7.5	w.	26	nw.	8	1	7	22	8.3	.0	.0
Alaska																																
Fairbanks	484	11	87		[4] 29.94		−1.6	−4.7	35	22	8	−38	26	−11				90	.54	−.2	14	3.4	n.	23	sw.	22	8	6	16		8.3	13.6
Juneau	132	96	116		[4] 29.73		35.0	−.4	51	10	40	11	27	30					11.47	+2.3	26	8.6	s.	30	e.	28	5	0	25		8.9	4.8
Nome	43	25	51		[4] 29.84		18.8	+3.1	34	21	25	−3	25	12				75	.96	.0	14	12.5	ne.	35	s.	29	10	2	18		8.8	6.7
Hawaiian Islands																																
Honolulu	38	86	100		29.94		75.7	+1.2	84	4	80	65	29	71				71	.26	−3.6	4	8.2	e.	24	ne.	8	9	17	4		.0	.0

LATE REPORTS FOR OCTOBER 1941

District and station	Barometer above sea level	Thermometer above ground	Anemometer above ground	Station, reduced to mean of 24 hours	Sea level, reduced to mean of 24 hours	Departure from normal	Mean max.+mean min.÷2	Departure from normal	Maximum	Date	Mean maximum	Minimum	Date	Mean minimum	Greatest daily range	Mean wet thermometer	Mean temperature of the dew-point	Mean relative humidity	Total	Departure from normal	Days with 0.01, or more	Average hourly velocity	Prevailing direction	Miles per hour	Direction	Date	Clear days	Partly cloudy days	Cloudy days	Average cloudiness, tenths	Total snowfall	Snow, sleet, and ice on ground at end of month
Alaska																																
Anchorage	135	36	47	[4] 29.48	[4] 29.63		32.6	−3.4	53	6	40	11	22	26	22	32	27	76	1.43	−.8	9	5.3	n.	34	n.	16	7	7	17	6.5	3.5	0.0
Barrow	25	4	27	[4] 29.85	[4] 29.87		12.3	−4.3	33	1	18	−11	16	7	29	13	12		.32	−.2	10	14.1	se.				4	6	21	7.8	2.2	2.0
Bethel	22	5	32	[4] 29.60	[4] 29.65		32.8	+1.4	52	6	39	11	14	27	21	32	29	82	1.67	+.1	14		ne.				5	9	17	7.1	.5	.3
Fairbanks	484	11	87	[4] 29.22	[4] 29.76		23.2	−3.4	56	4	32	−6	14	15	32	23	19	80	.88	.0	14	4.5	n.	18	w.	5	6	6	19	6.9	8.3	7.4
Juneau	132	96	116	[4] 29.65	[4] 29.74		43.5	+.2	53	7	48	32	28	39	16	42	39	85	16.22	+4.8	25	8.0	se.	26	e.	16	1	2	28	9.3	T	.0
Ketchikan	75	69	85	[4] 29.80	[4] 29.82		48.0	+1.4	57	17	52	34	28	44	17	47	45	88	22.79	+2.6	29	8.3	se.	45	se.	17	1	1	29	9.4	.0	.0
Nome	43	25	51	[4] 29.60	[4] 29.62		33.3	+4.0	48	4	38	12	30	29	19	33	29	77	2.56	+1.0	19	12.5	ne.	44	s.	3	6	4	21	7.1	.7	.5

[1] Data are airport records.
[2] Barometric data (adjusted to old city elevation) and hygrometric data from airport; otherwise city office records.
[3] Observations taken bihourly.
[4] Pressure not reduced to a mean of 24 hours.
[5] Barometric data from airport records, other data from city office records.
[6] Wind, clear, partly cloudy and cloudy data from city office records, other data from airport.

NOTE.—Except as indicated by notes 1, 2, 5, and 6, data in table are city office records

SEVERE LOCAL STORMS, NOVEMBER 1941

[Compiled by Mary O. Souder]

[The table herewith contains such data as has been received concerning severe local storms that occurred during the month. A revised list of tornadoes will appear in the United States Meteorological Yearbook]

Place	Date	Time	Width of path, yards	Loss of life	Value of property destroyed	Character of storm	Remarks
Iowa	Oct. 31-Nov. 1 and Nov. 4-5				$250,000	Sleet and snow	Both of these storms covered about the same area. The heavy, wet snow mixed with rain, clung to electric and telephone lines until the accumulated weight caused the wires to break carrying the poles. The area of damage began in Mills and Montgomery Counties and extended northward to the Minnesota border. The eastern boundary of the damage extended northward through Audubon, Greene, Webster, and Kossuth Counties. The western boundary extended northward along the Missouri River into Woodbury County, and thence northeastward across Cherokee, Clay, and Dickinson Counties. At the southern end the storm extended westward into Nebraska. Centers of greatest damage were located at Council Bluffs, Carroll, and Storm Lake. In addition to the damage to wires, there was some interruption of highway and rail traffic and many trees and limbs broken. Many communities were isolated for short periods. The interruption of electric service handicapped farmers using electric power, operators of cold storage lockers, and local newspapers. Total cost to permanent repairs to power and telephone equipment will amount to in excess of $250,000, but, outside of delay, discomfort, and inconvenience, loss to other interests was rather small.
Buffalo, N. Y.	7-8				14,000	Wind	Navigation at standstill. A cargo of wheat was swept into the water when a barge with a broken steering cable was grounded in the harbor.
Highland City to Lakeland, Fla., and vicinities.	14		100		15,500	do	Property damage, $11,000; loss in crops, $4,500; path 10 miles long.
Stevensville, Mont	24	8:30-9:30 p. m.			5,000	do	Several barns and small buildings damaged; buildings demolished; many trees uprooted and windows broken.
Washington, western portion of State.	24			1		do	Several boats and a sea-plane hangar blown from their moorings. Man drowned; minor damage to power and communication lines.
Stanford, Mont., and vicinity.	24-25				3,000	do	Several buildings blown over and hay lost from stacks.
LATE REPORTS FOR OCTOBER, 1941							
Mansfield, La., vicinity of	26	10 p. m.	100	1		Tornado	12 houses damaged with loss of household goods. An automobile demolished and 10 persons injured.
Lake Charles, La., vicinity of	30	9:30 a. m.	20	0	20,000	do	2 persons injured; property damaged.

SOLAR RADIATION AND SUNSPOT DATA FOR NOVEMBER 1941

[Solar Radiation Investigations Section, I. F. HAND in charge]

SOLAR RADIATION OBSERVATIONS

By HELEN CULLINANE and IOLA PAINE

Measurements of solar radiant energy received at the surface of the earth are made at 9 stations maintained by the Weather Bureau and at 12 cooperating stations maintained by other institutions. The intensity of the total radiation from sun and sky on a horizontal surface is continuously recorded (from sunrise to sunset) at all these stations by self-registering instruments; pyrheliometric measurements of the intensity of direct solar radiation at normal incidence are made at frequent intervals on clear days at three Weather Bureau stations (Madison, Wis.; Lincoln, Nebr.; and Albuquerque, N. Mex.), and at the Blue Hill Observatory at Harvard University. Occasional observations of sky polarization are taken at the Weather Bureau station at Madison and at Blue Hill Observatory.

The geographic coordinates of the stations, descriptions of the instrumental equipment, station exposures, and methods of observation, together with summaries of the data obtained, up to the end of 1939, are given in the MONTHLY WEATHER REVIEW for December 1937, April 1941, and September 1941.

Table 1 contains the measurements of the intensity of direct solar radiation at normal incidence, with means and their departures from normal (means based on less than 3 values are in parentheses). At Lincoln, Madison, Albuquerque, and Blue Hill the observations are obtained with a recording thermopile, checked by observations with a Smithsonian silver-disk pyrheliometer at Blue Hill. The table also gives vapor pressures at 7:30 a. m. and at 1:30 p. m. (75th meridian time).

Table 2 contains the daily total amounts of radiation received on a horizontal surface from both sun and sky for all stations except Fairbanks, Alaska; and also the weekly means, their departures from normal, and the accumulated departures since the beginning of the year. The values at most of the stations are obtained from the Eppley pyrheliometer recording either on a microammeter or a potentiometer. If the daily figures for total solar and sky radiation at Fairbanks should be desired, they may be obtained approximately 2 months after the date of the observation by writing to the Solar Radiation Investigations Supervisory Station, Blue Hill Observatory, Milton, Mass. Table 2 also includes values of ultraviolet radiation below 3132 Angströms at San Juan (see MO. WEA. REV., Sept. 1941, p. 286).

Radiation at normal incidence was below normal at Madison and Lincoln and close to normal at Blue Hill during November.

Total solar and sky radiation received on a horizontal surface during November was below normal for all stations for which normals have been computed with the exception of Washington, New York, New Orleans, and Riverside.

The single polarization observation made on the 26th is lower than both the November mean and mean maximum.

The single polarization observation made on the 26th at Madison serves as both the mean and the maximum for the month.

The pyrheliometric equipment at Cornell University was recalibrated by Helen Cullinane during the latter part of November and found to be about 9 percent low. Corrected data for this station are given in table 2-A.

In table 2, "Pyrheliometric Instrumental Data," page 264 of the September 1941 MONTHLY WEATHER REVIEW, it was erroneously stated that the station at Twin Falls is under the direction of the Bureau of Plant Industry. This station is under the direct supervision of J. R. Douglass, of the Bureau of Entomology and Plant Quarantine.

TABLE 1.—*Solar radiation intensities during November 1941*

[Gram-calories per minute per square centimeter of normal surface]

MADISON, WIS.

Date	Sun's zenith distance										
	7:30 a. m.	78.7°	75.7°	70.7°	60.0°	0.0°	60.0°	70.7°	75.7°	78.7°	1:30 p. m.
	75th mer. time	Air mass A. M.					Air mass P. M.				Local mean solar time
	e.	5.0	4.0	3.0	2.0	[1] 1.0	2.0	3.0	4.0	5.0	e.
	mm.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	mm.
Nov. 14	5.79		0.53	0.74		1.46					6.50
Nov. 18	8.18	0.55	.71	.86		1.41		0.74			9.83
Nov. 24	1.88	.81	.98	1.14		1.50		1.10			2.49
Nov. 26	2.36	.90	1.02	1.13		1.48		1.06			2.74
Nov. 27	4.37	.98	1.07	1.11		1.51					5.36
Nov. 28	4.37	.41	.57	.80		1.36		.87			6.76
Means		.73	.81	.96		1.45		.94			
Departures		−.14	−.18	−.19		−.09		−.03			

ALBUQUERQUE, N. MEX.

Date	7:30 a. m. e.	5.0	4.0	3.0	2.0	[1] 1.0	2.0	3.0	4.0	5.0	1:30 p. m. e.
Nov. 1	3.46	1.05		1.28							3.30
Nov. 2	5.15	.95		1.26	1.41		1.39	1.20	1.09	1.00	4.75
Nov. 3	4.75				1.34			1.23	1.10	.97	6.02
Nov. 4	4.95				1.40					.96	4.75
Nov. 5	4.36				1.34	1.48	1.38	1.25	1.11	1.02	4.36
Nov. 6	3.96				1.43						3.82
Nov. 7	4.58	1.06	1.15		1.42				1.18		1.78
Nov. 8	2.26								1.20	1.12	1.88
Nov. 10	2.86	1.07	1.16	1.29	1.42	1.55	1.40				3.30
Nov. 11	3.96	.98	1.10	1.24	1.39	1.44	1.39	1.26	1.16	1.05	4.17
Nov. 12	3.96			1.22	1.37						4.75
Nov. 13	5.36						1.40	1.14	1.00	.88	7.29
Nov. 14	5.36	.91	1.02	1.16	1.35		1.38	1.21	1.11	1.02	4.95
Nov. 15	5.56	.97	1.07	1.19	1.35		1.36	1.25	1.14	1.06	6.02
Nov. 16	5.15			1.25	1.39	1.60	1.38	1.23	1.05	1.00	6.50
Nov. 17	5.15	.95	1.05	1.12	1.31		1.34	1.07	.94	.82	5.15
Nov. 19	3.00			1.32	1.48	1.78	1.45	1.26			2.49
Nov. 20	2.62	1.11	1.20	1.31	1.45	1.59	1.43	1.26	1.14	1.03	3.30
Nov. 21	3.00			1.26	1.40						2.74
Nov. 22	4.58			1.28			1.42	1.24	1.13	1.06	3.82
Nov. 23	1.88	1.10	1.20	1.32	1.46	1.78	1.40	1.27	1.16	1.07	2.06
Nov. 24	1.88		1.24	1.32			1.47	1.35	1.24	1.15	2.28
Nov. 25	2.06	1.14	1.23	1.34	1.45		1.45	1.31	1.22	1.11	2.61
Nov. 26	2.49	1.11	1.21	1.32	1.45		1.45	1.31	1.18	1.07	2.74
Nov. 27	3.00	1.11	1.20	1.32	1.45			1.31	1.17	1.11	3.30
Nov. 29	5.15				1.40			1.24	1.15		5.36
Nov. 30	3.46						1.42	1.28	1.19	1.08	4.17
Means		1.04	1.15	1.27	1.40	1.60	1.41	1.25	1.13	1.03	

TABLE 1.—*Solar radiation intensities during November 1941*—Con.

[Gram-calories per minute per square centimeter of normal surface]

LINCOLN, NEBR.

Date	Sun's zenith distance										
	7:30 a. m.	78.7°	75.7°	70.7°	60.0°	0.0°	60.0°	70.7°	75.7°	78.7°	1:30 p. m.
	75th mer. time	Air mass A. M.					Air mass P. M.				Local mean solar time
	e.	5.0	4.0	3.0	2.0	[1] 1.0	2.0	3.0	4.0	5.0	e.
	mm.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	mm.
Nov. 1	3.00	0.92	1.07	1.20	1.36		1.34	1.14			4.17
Nov. 6	3.30								1.03	0.90	4.17
Nov. 11	4.17							1.24	1.11	1.01	4.57
Nov. 12	4.17						1.34	1.16	1.01	.88	4.57
Nov. 16	4.57		.68	.88	1.18		1.18				5.56
Nov. 17	7.87	.88	1.01	1.14	1.25		1.25	1.03	.92	.82	7.57
Nov. 21	3.15	.92	1.07	1.22				1.20	1.09	.99	3.45
Nov. 24	2.26	.83	.98	1.20				1.20	1.05	.96	2.16
Nov. 25	3.30		.101	1.20							3.63
Nov. 26	3.99	.75	.92	1.07							4.37
Nov. 27	3.99	.83	.94	1.16				1.16	1.03	.92	4.37
Nov. 28	5.16							1.09	.94	.81	5.56
Means		.86	.96	1.13	1.26		1.28	1.15	1.02	.91	
Departures		−.04	−.06	−.04	−.10		−.07	−.03	−.02	−.01	

BLUE HILL, MASS.

Date	7:30 a. m. e.	5.0	4.0	3.0	2.0	[1] 1.0	2.0	3.0	4.0	5.0	1:30 p. m. e.
Nov. 4	5.0	0.92	1.00	1.13							4.8
Nov. 5	7.1								0.55	0.45	6.3
Nov. 7	9.9								.76	.55	12.8
Nov. 8	4.2	.81	.88	.98	1.15						5.0
Nov. 12	3.5						1.30	1.19	1.09	.99	1.8
Nov. 13	1.9	.83	.93								3.2
Nov. 15	6.3								.61	.49	6.3
Nov. 17	2.2	1.07						1.10	.95	.85	1.7
Nov. 18	5.0	.68	.80	.93				.82			4.4
Nov. 19	5.6	.54	.64								7.6
Nov. 20	9.2	.69	.81								9.9
Nov. 21	4.4							1.11	.98	.89	2.9
Nov. 22	3.3	.96	1.05					1.15	.99		2.5
Nov. 24	4.6								1.06	.97	2.8
Nov. 25	2.0	1.03	1.12	1.19							2.9
Nov. 28	4.2	.74	.85	.98							3.8
Means		.83	.90	1.04	1.15		1.30	1.07	.86	.74	
Departures		−.06	−.07	−.05	−.08		+.10	+.04	−.06	−.06	

[1] Extrapolated.

TABLE 2.—*Daily totals and weekly means of solar radiation (direct + diffuse) received on a horizontal surface*

[Gram-calories per square centimeter]

Date	Washington	Madison	Lincoln	New York	Chicago	Fresno	Albuquerque	Fairbanks	Newport	Cambridge	Friday Harbor	Riverside	New Orleans	La Jolla	State College	Ithaca	San Juan	Twin Falls	San Juan *ultra violet below 3152 A*
	cal.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*milligram cal.*
Oct. 29	335	154	39	326	122	319	70	-------	341	300	216	379	325	318	339	321	354	95	286
Oct. 30	192	40	58	85	8	356	191	-------	111	79	156	380	252	395	161	41	361	267	329
Oct. 31	82	31	28	58	10	323	408	-------	69	109	59	382	311	386	43	48	384	233	281
Nov. 1	66	32	374	14	12	157	393	-------	30	27	226	277	539	331	25	95	370	149	208
Nov. 2	325	303	241	216	301	248	328	-------	250	130	146	341	536	355	27	31	259	69	188
Nov. 3	258	295	264	222	250	303	360	-------	288	242	214	329	460	348	196	158	412	169	323
Nov. 4	268	170	90	222	151	67	309	-------	290	280	29	325	215	302	171	171	82	234	94
Mean	218	146	156	163	122	253	302	53	197	167	149	345	377	348	138	124	382	174	262
Departure	−23	−39	−78	−15	−39	−78	−70	+11	−33	−11	+15	+40	+71	+8	-------	−28	-------	−42	-------
Nov. 5	243	75	41	157	30	233	371	-------	144	181	-------	347	340	364	185	210	277	170	95
Nov. 6	73	71	232	16	3	316	356	-------	52	50	231	345	434	360	21	26	314	234	296
Nov. 7	179	74	147	224	29	301	379	-------	176	90	171	342	432	278	65	65	303	283	160
Nov. 8	199	121	65	110	26	267	382	-------	254	251	155	344	453	342	94	81	393	251	362
Nov. 9	195	92	148	99	80	238	338	-------	103	141	190	329	359	322	128	209	341	282	305
Nov. 10	130	39	98	168	146	298	361	-------	213	215	63	334	304	341	101	76	214	283	312
Nov. 11	267	105	234	176	23	251	347	-------	247	195	186	177	384	169	97	17	384	274	241
Mean	184	82	138	136	48	272	362	28	170	160	142	317	387	311	99	98	335	254	259
Departure	−40	−83	−96	−20	−92	−26	+9	−8	−51	−13	+28	+21	+91	+1	-------	−53	-------	+45	-------
Nov. 12	257	246	277	152	194	280	267	-------	248	224	175	228	419	279	33	52	331	115	264
Nov. 13	263	181	210	112	207	287	300	-------	126	156	20	309	363	291	230	117	313	206	3
Nov. 14	358	138	207	178	181	291	335	-------	210	192	42	307	391	217	214	78	270	119	294
Nov. 15	243	117	217	210	225	244	334	-------	224	195	55	307	406	332	220	118	252	133	257
Nov. 16	224	200	224	222	213	104	334	-------	214	197	38	289	389	105	181	46	300	62	2
Nov. 17	285	213	249	261	219	255	321	-------	273	249	62	286	332	268	276	263	249	102	189
Nov. 18	232	207	228	190	209	305	51	-------	234	214	96	326	325	326	186	191	208	119	169
Mean	266	186	230	189	207	252	277	28	218	204	70	293	375	260	192	124	286	122	252
Departure	+67	+35	+21	+55	+72	0	−55	0	+30	+14	−21	+12	+129	−38	-------	+22	-------	−45	-------
Nov. 19	194	32	97	164	119	297	342	-------	209	168	183	333	144	338	140	134	294	172	224
Nov. 20	225	54	256	179	167	299	343	-------	223	208	112	339	260	334	80	79	322	221	152
Nov. 21	186	221	277	218	79	295	177	-------	231	243	118	352	57	337	92	33	163	248	36
Nov. 22	246	157	65	190	74	266	326	-------	253	236	162	314	195	304	199	176	352	226	254
Nov. 23	68	241	262	34	155	284	337	-------	15	29	108	329	194	340	30	18	252	253	83
Nov. 24	211	225	266	244	230	283	334	-------	221	226	11	320	377	311	178	111	261	246	170
Nov. 25	243	134	254	168	186	223	323	-------	249	225	46	294	327	316	236	216	241	234	196
Mean	196	152	211	171	144	278	312	14	200	191	106	326	222	326	136	110	269	229	162
Departure	+11	+21	+11	+43	+20	+40	+23	−3	+36	+10	+1	+52	−24	+25	-------	−17	-------	+68	-------
Nov. 26	266	218	253	160	217	187	322	-------	182	153	59	214	357	280	206	144	252	245	133
Nov. 27	267	205	248	195	132	159	315	-------	189	176	63	186	320	227	184	70	377	225	295
Nov. 28	214	189	241	212	191	208	221	-------	221	199	34	273	312	285	197	193	336	214	337
Nov. 29	246	83	62	167	185	46	306	-------	201	183	31	92	244	161	207	143	403	186	228
Nov. 30	197	28	40	107	18	132	288	-------	99	60	96	282	133	301	36	27	346	197	252
Dec. 1	89	61	186	149	51	107	295	-------	223	137	23	279	198	276	22	127	244	213	239
Dec. 2	87	172	225	29	27	74	310	-------	50	52	62	255	167	239	30	26	369	27	314
Mean	195	137	179	145	117	130	299	12	166	137	37	226	247	253	126	104	327	187	261
Departure	+29	+12	−3	+28	+19	−84	+21	−2	−10	−18	−47	−25	+19	−29	-------	+15	-------	+34	-------

ACCUMULATED DEPARTURES ON DEC. 2, 1941

	+5,894	+3,122	−8,414	+18,683	+15,372	−3,094	-------	−1,505	−357	−189	-------	+70	+16,576	−4,501	-------	-------	-------	-------	-------

TABLE 2A.—*Corrections to Ithaca data*

	Cal.		Cal.		Cal.		Cal.
July 2	534	Aug. 6	690	Sept. 10	444	Oct. 15	374
July 3	578	Aug. 7	719	Sept. 11	358	Oct. 16	345
July 4	552	Aug. 8	711	Sept. 12	570	Oct. 17	417
July 5	770	Aug. 9	414	Sept. 13	566	Oct. 18	57
July 6	489	Aug. 10	747	Sept. 14	570	Oct. 19	248
July 7	320	Aug. 11	469	Sept. 15	542	Oct. 20	365
July 8	476	Aug. 12	382	Sept. 16	490	Oct. 21	156
Average	530	Average	590	Average	506	Average	280
Departure	−37	Departure	+123	Departure	+158	Departure	+4
July 9	762	Aug. 13	638	Sept. 17	452	Oct. 22	284
July 10	764	Aug. 14	544	Sept. 18	485	Oct. 23	44
July 11	390	Aug. 15	138	Sept. 19	565	Oct. 24	155
July 12	447	Aug. 16	354	Sept. 20	543	Oct. 25	86
July 13	723	Aug. 17	672	Sept. 21	544	Oct. 26	286
July 14	734	Aug. 18	586	Sept. 22	532	Oct. 27	48
July 15	642	Aug. 19	394	Sept. 23	394	Oct. 28	56
Average	638	Average	475	Average	502	Average	136
Departure	+116	Departure	+5	Departure	+130	Departure	−31
July 16	651	Aug. 20	702	Sept. 24	487		
July 17	587	Aug. 21	612	Sept. 25	355		
July 18	740	Aug. 22	468	Sept. 26	285		
July 19	707	Aug. 23	607	Sept. 27	502		
July 20	754	Aug. 24	594	Sept. 28	401		
July 21	713	Aug. 25	243	Sept. 29	316		
July 22	587	Aug. 26	371	Sept. 30	200		
Average	678	Average	513	Average	364		
Departure	+128	Departure	+30	Departure	+38		
July 23	553	Aug. 27	594	Oct. 1	284		
July 24	691	Aug. 28	670	Oct. 2	398		
July 25	686	Aug. 29	565	Oct. 3	94		
July 26	720	Aug. 30	533	Oct. 4	293		
July 27	705	Aug. 31	311	Oct. 5	290		
July 28	342	Sept. 1	570	Oct. 6	368		
July 29	627	Sept. 2	619	Oct. 7	284		
Average	617	Average	551	Average	287		
Departure	+137	Departure	+28	Departure	−5		
July 30	269	Sept. 3	566	Oct. 8	101		
July 31	240	Sept. 4	312	Oct. 9	326		
Aug. 1	528	Sept. 5	448	Oct. 10	224		
Aug. 2	748	Sept. 6	594	Oct. 11	320		
Aug. 3	743	Sept. 7	612	Oct. 12	207		
Aug. 4	585	Sept. 8	595	Oct. 13	430		
Aug. 5	686	Sept. 9	489	Oct. 14	56		
Average	543	Average	517	Average	237		
Departure	+29	Departure	+83	Departure	−33		

TABLE 1.—*Solar radiation intensities during October 1941*

[Gram-calories per minute per square centimeter of normal surface]

LATE DATA—TABLE 1-A, BLUE HILL, MASS.

Date	Sun's zenith distance										
	8 a.m.	78.7°	75.7°	70.7°	60.0°	0.0°	60.0°	70.7°	75.7°	78.7°	1:30 p.m.
	75th mer. time	Air mass A. M.					Air mass P. M.				Local mean solar time
	e.	5.0	4.0	3.0	2.0	*1.0	2.0	3.0	4.0	5.0	e.
	mm.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	mm.
Oct. 8	8.8	0.81	0.97	1.08							7.4
Oct. 9	4.8	.90	1.01								5.8
Oct. 11	5.4	.91	.98								4.2
Oct. 13	6.3	.89	1.00					1.08	0.97	0.86	5.8
Oct. 16	5.6	.88	.97	1.07			1.27	1.11		.95	4.4
Oct. 18	6.5	1.03	1.12	1.24			1.30	1.17	1.05	.94	6.8
Oct. 19	8.8			.88					.90	.79	5.8
Oct. 20	4.4	.93		1.18			1.25	1.07	.96		4.0
Oct. 22	6.5	.84	.96	1.07				1.11	.99	.89	6.3
Oct. 24	2.9	.97	1.06	1.17	1.31			1.07		.83	2.8
Oct. 26	2.1	1.04	1.11	1.22	1.33						1.3
Oct. 29	2.6	.97	1.06	1.17			1.25				2.8
Mean		.92	1.02	1.12	1.32		1.27	1.10	.97	.87	
Departure		+.03	+.03	0	+.05		+.02	0	+.01	+.03	

TABLE 1.—*Solar radiation intensities during October 1941*—Con.

TABLE 2-A

	Twin Falls	Fairbanks		Twin Falls	Fairbanks
	cal.	cal.		cal.	cal.
Oct. 1	336		Oct. 15	363	
Oct. 2	491		Oct. 16	339	
Oct. 3	455		Oct. 17	396	
Oct. 4	120		Oct. 18	372	
Oct. 5	252		Oct. 19	189	
Oct. 6	428		Oct. 20	130	
Oct. 7	426		Oct. 21	114	
Mean	358	112	Mean	272	46
Departure	−5	−6	Departure	−50	−24
Oct. 8	455		Oct. 22	363	
Oct. 9	517		Oct. 23	207	
Oct. 10	433		Oct. 24	250	
Oct. 11	421		Oct. 25	328	
Oct. 12	420		Oct. 26	318	
Oct. 13	421		Oct. 27	112	
Oct. 14	424		Oct. 28	157	
Mean	442	118	Mean	248	82
Departure	+87	+24	Departure	−31	+21

Accumulated departures on Oct. 28, 1941, Fairbanks, −1491.

POSITIONS, AREAS, AND COUNTS OF SUN SPOTS FOR NOVEMBER 1941

[Communicated by Capt. J. F. Hellweg, U. S. Navy (Ret.), Superintendent, U. S. Naval Observatory.] All measurements and spot counts were made at the Naval Observatory from plates taken at the observatories indicated. Difference in longitude is measured from the central meridian, positive toward the west. Latitude is positive toward the north. Areas are corrected for foreshortening and expressed in millionths of sun's hemisphere. For each day, under longitude, latitude, area of spot or group, and spot count, are included assumed longitude of center of the disk, assumed latitude of center of the disk, total area of spots and groups, and total spot count

Date	Eastern standard time		Mount Wilson group No.	Heliographic: Difference in longitude	Heliographic: Longitude	Heliographic: Latitude	Heliographic: Distance from center of disk	Area of spot or group	Spot count	Plate quality	Observatory
1941	h	m		°	°	°	°				
Nov. 1	11	6	7318	−47	279	+12	48	24	3	VG	Mt Wilson.
			7316	−6	320	+12	10	24	10		
			7317	+20	346	+4	20	48	8		
			7315	+37	3	+14	38	630	29		
			7315	+47	13	+12	48	533	12		
			7314	+48	14	0	48	24	1		
					(326)	(+4)		1,283	63		
Nov. 2	13	13	7318	−33	279	+11	34	12	1	F	U. S. Naval.
			7319	+21	333	+7	22	12	3		
			7317	+34	346	+3	34	291	18		
			7315	+50	2	+14	51	630	14		
			7315	+60	12	+11	60	533	17		
					(312)	(+4)		1,478	53		
Nov. 3	11	7	7318	−18	282	+11	20	48	2	F	Do.
			7320	+6	306	+3	7	12	1		
			7317	+48	348	+3	48	388	21		
			7315	+63	3	+14	63	582	16		
			7315	+74	14	+11	74	533	6		
					(300)	(+4)		1,563	46		
Nov. 4	11	1	7318	−3	284	+11	8	24	2	G	Do.
			7319	+47	334	+8	47	48	8		
			7317	+62	349	+3	62	485	25		
			7315	+76	3	+14	76	582	14		
			7315	+88	15	+11	88	388	3		
					(287)	(+4)		1,527	52		
Nov. 5	11	4	(*)	−61	212	+5	61	24	1	F	Do.
			7318	+6	279	+11	9	12	2		
			7318	+11	284	+11	13	24	1		
			7319	+62	335	+8	62	48	4		
			7317	+75	348	+4	75	582	8		
			7315	+88	1	+15	88	242	2		
					(273)	(+4)		932	18		
Nov. 6	11	5	7321	−70	190	−2	70	12	1	F	Mt. Wilson.
			7317	+88	348	+4	88	242	1		
					(260)	(+4)		254	2		

POSITIONS, AREAS, AND COUNTS OF SUN SPOTS FOR NOVEMBER 1941—Continued

Date	Eastern standard time	Mount Wilson group No.	Heliographic: Difference in longitude	Heliographic: Longitude	Heliographic: Latitude	Heliographic: Distance from center of disk	Area of spot or group	Spot count	Plate quality	Observatory
1914 Nov. 7	14 16	7322	−69	176	−3	69	6	1	F	U. S. Naval.
		7321	−54	191	−3	55	24	3		
		(*)	+35	280	+8	36	6	2		
				(245)	(+4)		36	6		
Nov. 8	11 1	7321	−44	190	−2	45	12	2	G	Mt. Wilson.
		7323	−35	199	+18	37	12	2		
				(234)	(+4)		24	4		
Nov. 9	10 46	7323	−17	204	+18	22	24	6	VG	Do.
		(*)	+10	231	+15	16	12	2		
				(221)	(+3)		36	8		
Nov. 10	11 5	7323	−3	205	+16	13	16	5	G	Do.
				(208)	(+3)		16	5		
Nov. 11	12 36	(1)	(1)	(1)	(1)	(1)	(1)	(1)	F	U. S. Naval.
Nov. 12	10 50	7324	−25	156	+8	26	73	4	F	Do.
				(181)	(+3)		73	4		
Nov. 13	10 42	(*)	−51	117	+22	53	12	2	G	Do.
		7325	−37	131	−8	38	133	8		
		7324	−11	157	+8	12	97	6		
				(168)	(+3)		242	16		
Nov. 14	10 49	7325	−23	132	−8	25	170	10	VG	Do.
		7324	+2	157	+8	7	158	14		
		7326	+50	205	+15	51	12	2		
				(155)	(+3)		340	26		
Nov. 15	10 34	7325	−9	133	−7	13	170	9	VG	Do.
		7324	+17	159	+8	19	145	10		
				(142)	(+3)		315	19		
Nov. 16	10 32	7325	+6	135	−6	10	145	10	G	Mt. Wilson.
		7324	+32	161	+9	33	97	10		
				(129)	(+3)		242	20		
Nov. 17	10 26	7325	+19	135	−6	21	121	9	G	U. S. Naval.
		7324	+44	160	+8	44	73	4		
				(116)	(+3)		194	13		
Nov. 18	11 32	7325	+33	135	−7	34	170	17	G	Do.
		7324	+57	159	+8	57	73	4		
				(102)	(+2)		243	21		
Nov. 19	11 4	7325	+47	136	−8	49	218	19	G	Do.
		7324	+70	159	+8	70	24	2		
				(89)	(+2)		242	21		
Nov. 20	12 33	7328	−80	355	+4	80	291	7	G	Do.
		7327	−62	13	+12	63	97	12		
		7325	+59	134	−9	60	194	1		
		7325	+62	137	−8	63	97	12		
		7324	+85	160	+8	85	24	1		
				(75)	(+2)		703	33		
Nov. 21	11 35	7329	−88	334	−19	88	727	1	F	Do.
		7328	−67	355	+4	67	194	2		
		(*)	−65	357	+17	66	24	2		
		7325	+71	133	−9	72	170	4		
				(62)	(+2)		1,115	9		
Nov. 22	10 30	7329	−75	335	−19	76	679	10	F	Do.
		7328	−54	356	+4	54	194	4		
		7325	+88	138	−9	88	145	1		
				(50)	(+2)		1,018	15		
Nov. 23	11 11	7331	−79	317	+10	79	242	1	VG	Mt. Wilson.
		7329	−61	335	−18	63	727	15		
		7328	−38	358	+5	39	194	4		
		7330	−22	14	+10	24	121	15		
		7330	−19	17	+12	22	24	10		
				(36)	(+2)		1,308	45		
Nov. 24	12 5	7332	−79	303	+9	79	12	1	VG	U. S. Naval.
		7331	−65	317	+10	65	388	6		
		7329	−50	332	−20	53	436	15		
		7329	−42	340	−20	46	194	3		
		7328	−26	356	+4	27	194	4		
		7330	−9	13	+9	12	339	20		
				(22)	(+2)		1,563	49		
1941 Nov. 25	10 2	7332	−67	303	+12	67	48	7	VG	Do.
		7331	−59	311	+9	59	12	1		
		7331	−51	319	+10	52	388	5		
		7329	−39	331	−20	43	436	15		
		7329	−31	339	−20	37	218	3		
		7328	−12	358	+4	12	145	2		
		7330	+4	14	+9	8	291	16		
				(10)	(+2)		1,538	49		
Nov. 26	11 23	7332	−54	303	+12	55	48	3	G	Do.
		7331	−39	318	+10	40	291	7		
		7329	−25	332	−20	32	364	9		
		7329	−18	339	−20	27	218	6		
		7328	+1	358	+4	5	145	1		
		7330	+12	9	+8	14	73	7		
		7330	+21	18	+10	23	145	6		
				(357)	(+1)		1,284	39		
Nov. 27	11 22	7332	−40	303	+12	41	24	2	VG	Do.
		7331	−25	318	+9	26	291	9		
		7329	−11	332	−21	25	436	20		
		7329	−5	338	−20	21	242	13		
		*	+14	357	+8	16	12	4		
		7328	+15	358	+4	16	182	2		
		7330	+26	9	+8	27	24	3		
		7330	+35	18	+10	36	48	4		
				(343)	(+1)		1,259	57		
Nov. 28	10 46	7333	−80	250	−5	80	145	1	VG	Do.
		7332	−27	303	+12	30	24	6		
		7331	−11	319	+9	13	242	14		
		7329	+3	333	−21	22	339	30		
		7329	+8	338	−20	22	242	12		
		7328	+29	359	+4	29	145	5		
		7330	+49	19	+9	50	48	5		
				(330)	(+1)		1,185	73		
Nov. 29	10 24	7333	−67	251	−5	67	145	1	G	Do.
		7332	−12	306	+9	13	121	15		
		7331	+2	320	+9	9	194	7		
		7329	+16	334	−21	27	291	24		
		7321	+21	339	−20	29	218	10		
		7328	+42	0	+4	43	97	3		
		7330	+62	20	+9	62	48	3		
				(318)	(+1)		1,114	63		
Nov. 30	12 32	7333	−59	244	−6	59	12	3	G	Do.
		7333	−52	251	−6	53	133	1		
		7332	+3	306	+9	9	97	14		
		7331	+17	320	+9	19	145	3		
		7329	+30	333	−20	36	291	31		
		7334	+31	334	−14	33	24	5		
		7329	+37	340	−19	41	218	1		
		7328	+58	1	+3	58	73	3		
		7330	+74	17	+9	74	24	1		
				(303)	(+1)		1,017	62		

[1] No spots.

Mean daily area for 30 days........ =738

*=not numbered.
VG=very good; G=good; F=fair; P=poor.

PROVISIONAL RELATIVE SUNSPOT NUMBERS FOR NOVEMBER 1941

[Based on observations at Zurich or Locarno as indicated. Data furnished through the courtesy of Prof. W. Brunner, Eidgenössiches Sternwarte, Zurich, Switzerland]

November 1941	Relative numbers	November 1941	Relative numbers	November 1941	Relative numbers
1	51	11	0	21	....
2	53	12	*Ec* 13	22	*d?*..
3	57	13	*Ec* 24	23	**Mcd* 33
4	*49	14	*a*	24	*64
5	....	15	*26	25	*72
6	8	16	*a*..	26	**a*82
7	*0	17	23	27	....
8	*77	18	26	28	*ad*..
9	14	19	*23	29	*a*..
10	0	20	*d* 37	30	71

Mean, 22 days=33.3

*=Observed at Locarno.
a=Passage of an average-sized group through the central meridian.
b=Passage of a large group through the central meridian.
c=New formation of a group developing into a middle-sized or large center of activity *E*, on the eastern part of the sun's disk; *W*, on the western part; *M*, in the central-circle zone.
d=Entrance of a large or average-sized center of activity on the east limb.

U. S. GOVERNMENT PRINTING OFFICE: 1942

Chart I. Departure (°F.) of the Mean Temperature from the Normal, and Wind Roses for Selected Stations, November 1941

Chart I. Departure (°F.) of the Mean Temperature from the Normal, and Wind Roses for Selected Stations, November 1941

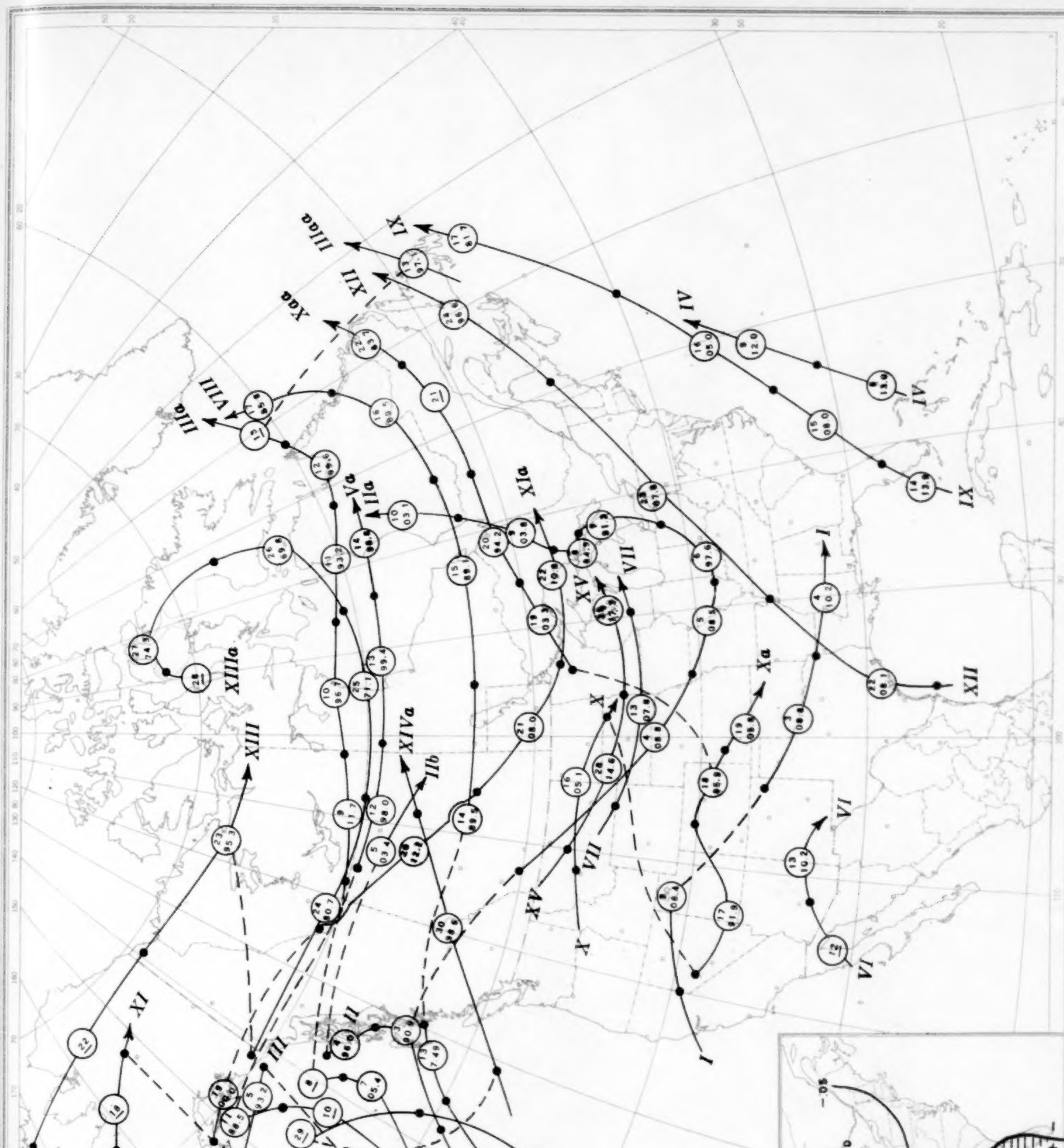
Chart II. Tracks of Centers of Anticyclones, November 1941. (Inset) Departure of Monthly Mean Pressure from Normal

Circle indicates position of anticyclone at 7:30 a. m. (75th meridian time), with barometric reading. Dot indicates position of anticyclone at 7:30 p. m. (75th meridian time).

Chart III. Tracks of Centers of Cyclones, November 1941. (Inset) Change in Mean Pressure from Preceding Month

Circle indicates position of anticyclone at 7:30 a. m. (75th meridian time), with barometric reading. Dot indicates position of anticyclone at 7:30 p. m. (75th meridian time).

Chart III. Tracks of Centers of Cyclones, November 1941. (Inset) Change in Mean Pressure from Preceding Month



Circle indicates position of cyclone at 7:30 a. m. (75th meridian time), with barometric reading. Dot indicates position of cyclone at 7:30 p. m. (75th meridian time).

Chart IV. Percentage of Clear Sky Between Sunrise and Sunset, November 1941

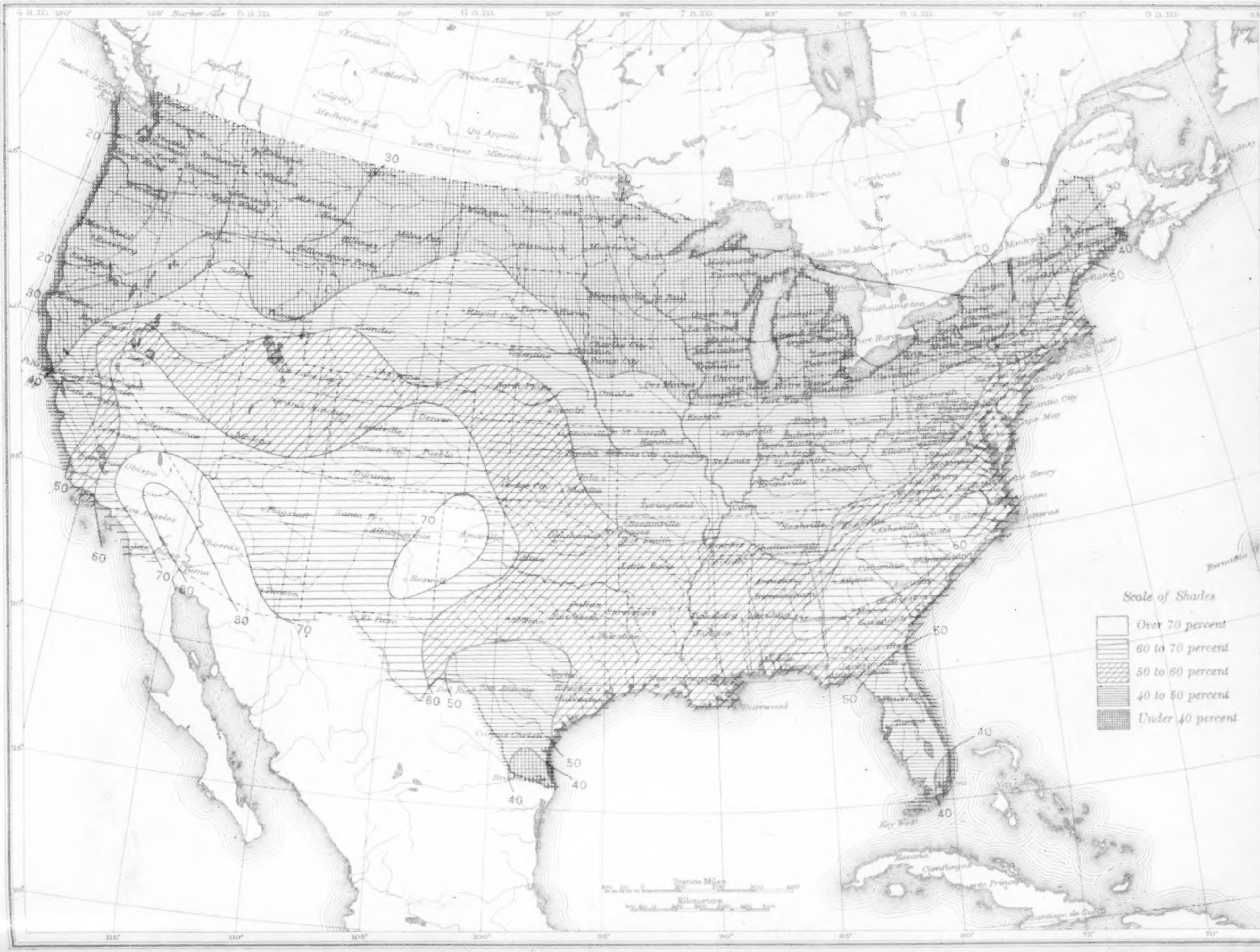


Chart V. Total Precipitation, Inches, November 1941

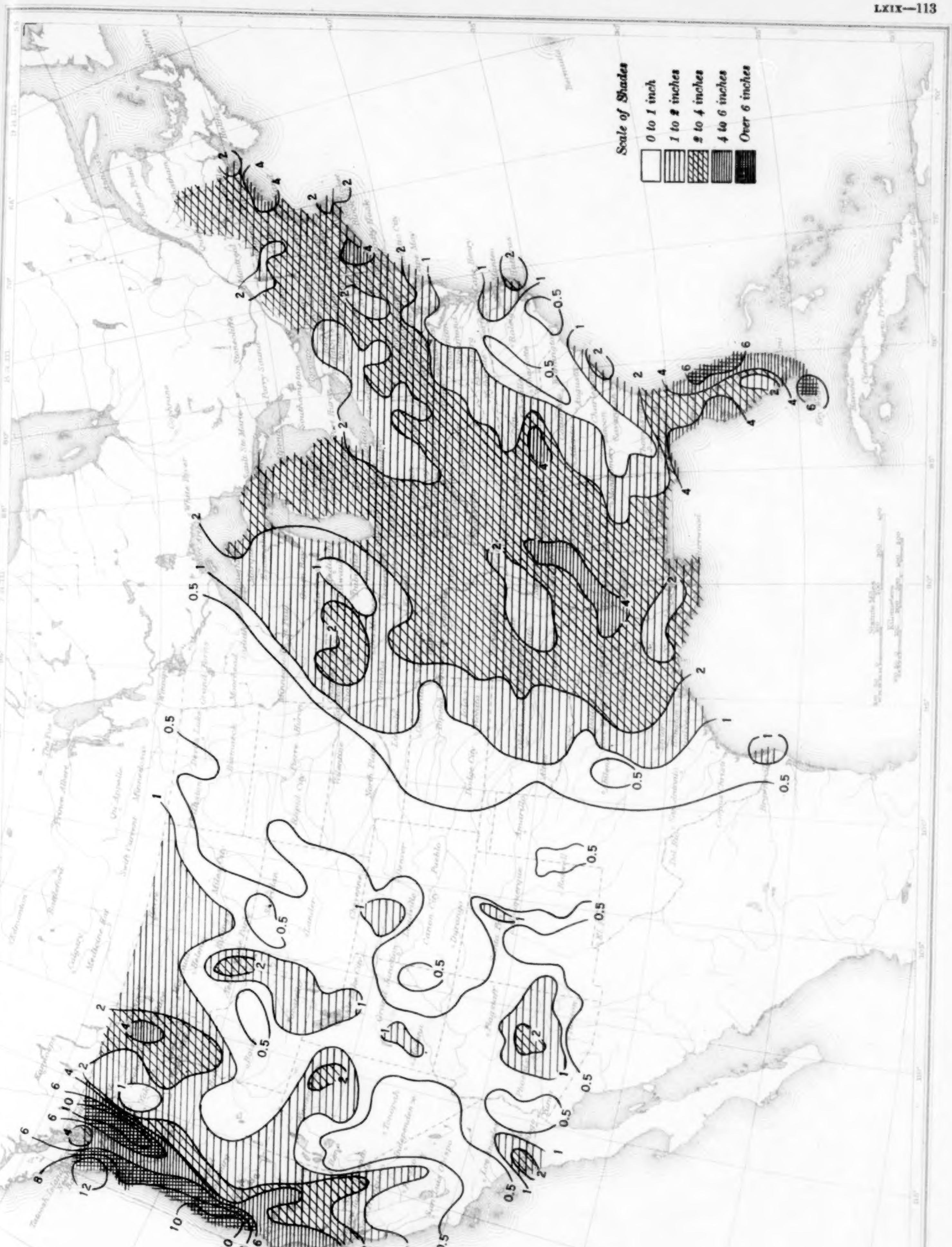


Chart VI. Isobars at Sea Level and Isotherms at Surface; Prevailing Winds, November 1941

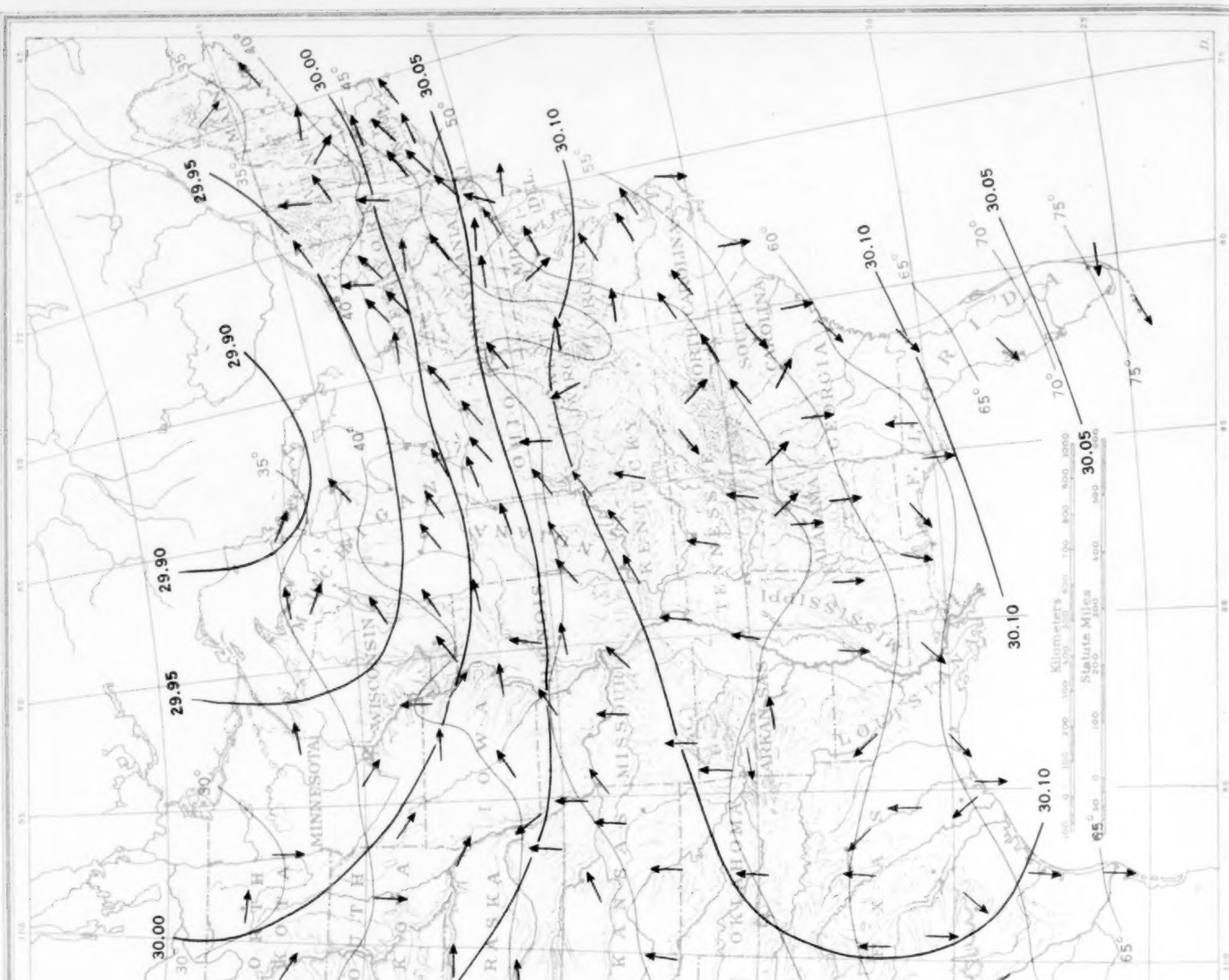


Chart VII. Total Snowfall, Inches, November 1941

Chart VIII. Isobars (mb) for 1,524 Meters (5,000 ft.) and Isotherms (°C.) and Resultant Winds for 1,500 Meters (m. s. l.) November 1941

Isobars and isotherms based on radiosonde observations at 12:30 a. m. (E. S. T.) and winds based on pilot-balloon observations at 5:00 a. m. (E. S. T.).

Chart VIII. Isobars (mb) for 1,524 Meters (5,000 ft.) and Isotherms (°C.) and Resultant Winds for 1,500 Meters (m. s. l.) November 1941

Isobars and isotherms based on radiosonde observations at 12:30 a. m. (E. S. T.) and winds based on pilot-balloon observations at 5:00 a. m. (E. S. T.).

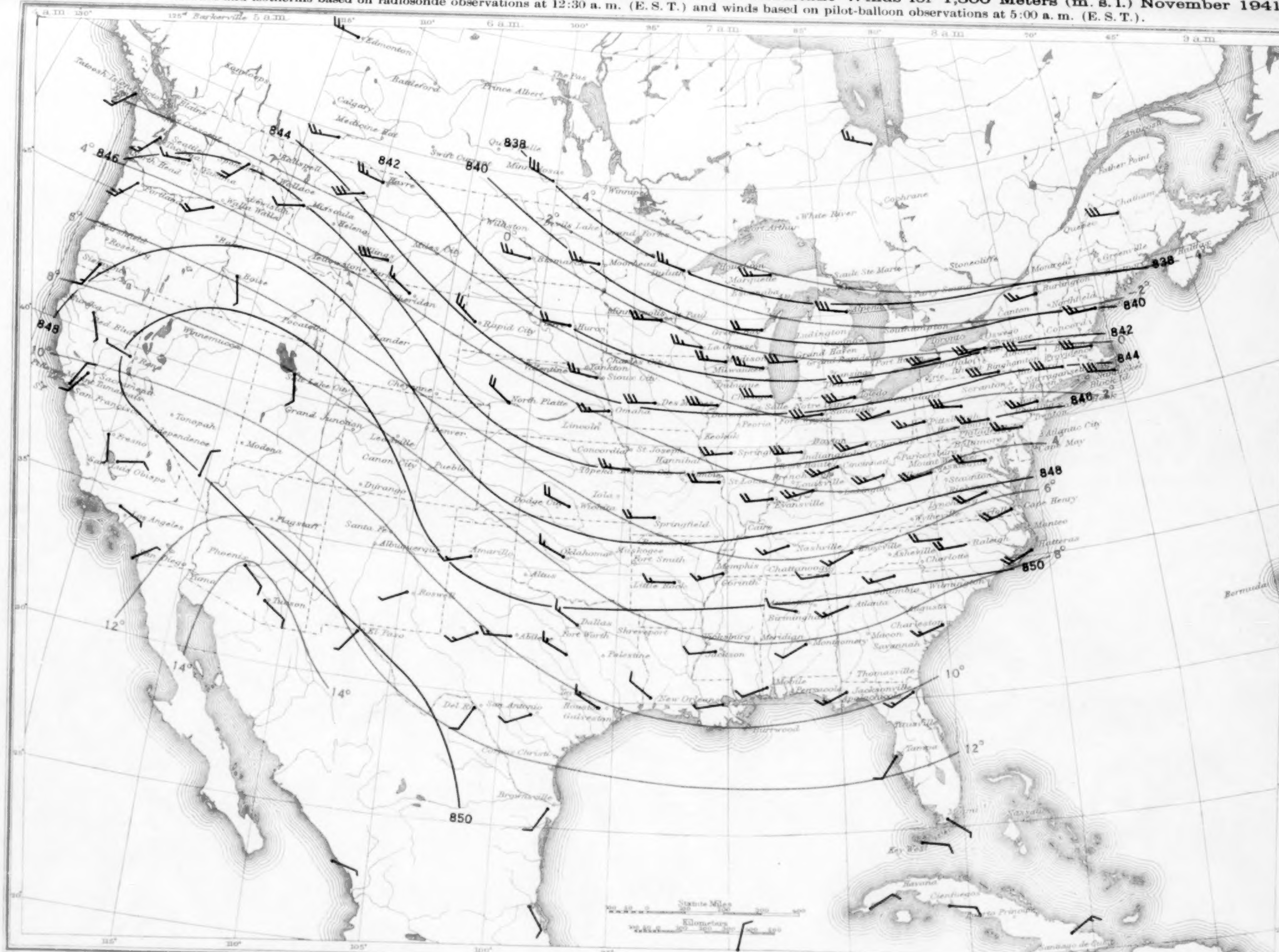
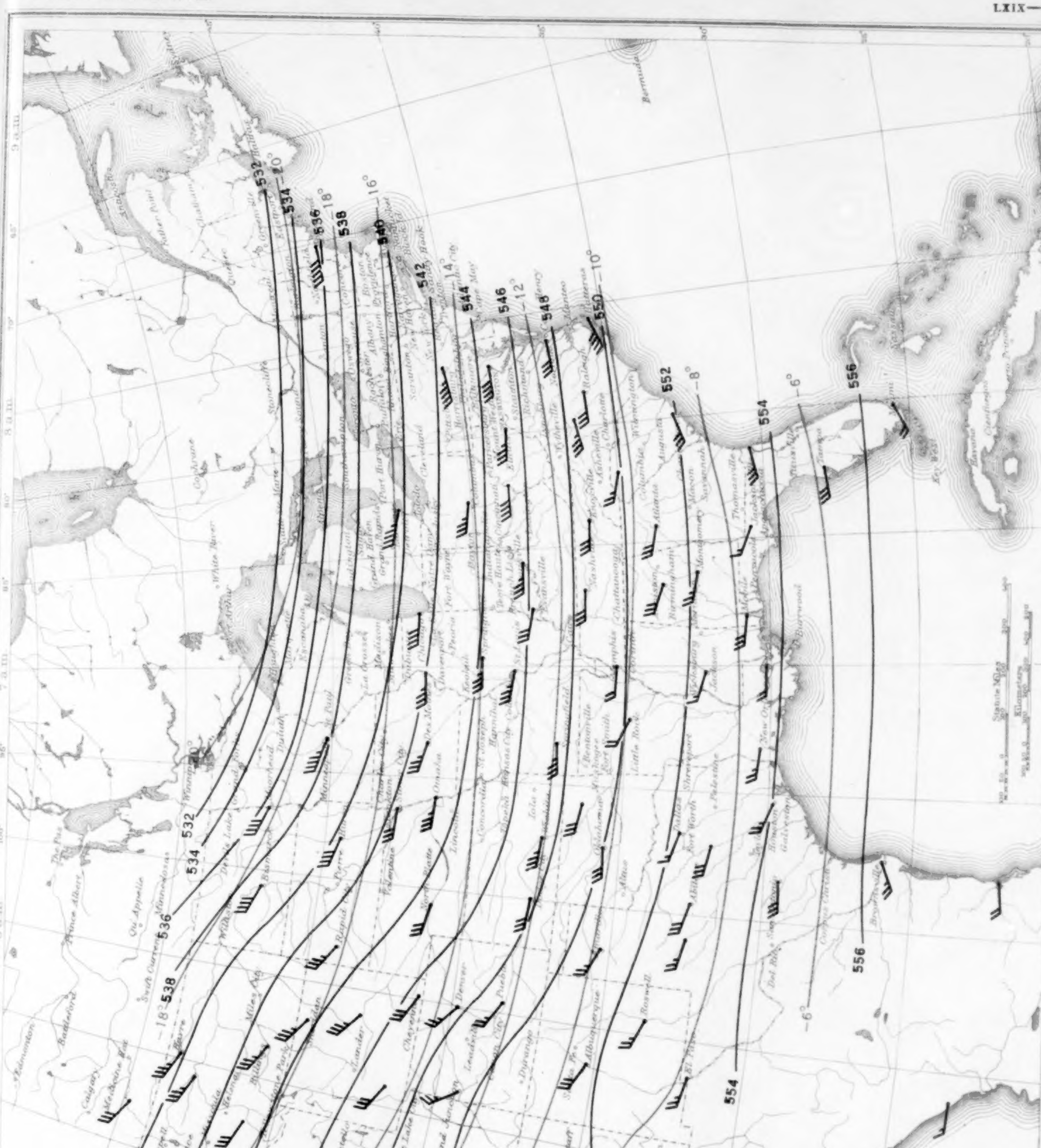


Chart IX. Isobars (mb) Isotherms (°C.) 1:00 a.m. (E.S.T) and Resultant Winds 5:00 a.m. (E.S.T.) for 3,000 Meters (m.s.l.) November 1941

Chart X. Isobars (mb) Isotherms (°C.) 1:00 a.m. (E. S. T.) and Resultant Winds 5:00 p.m. (E. S. T.) for 5,000 Meters (m. s. l.) November 1941



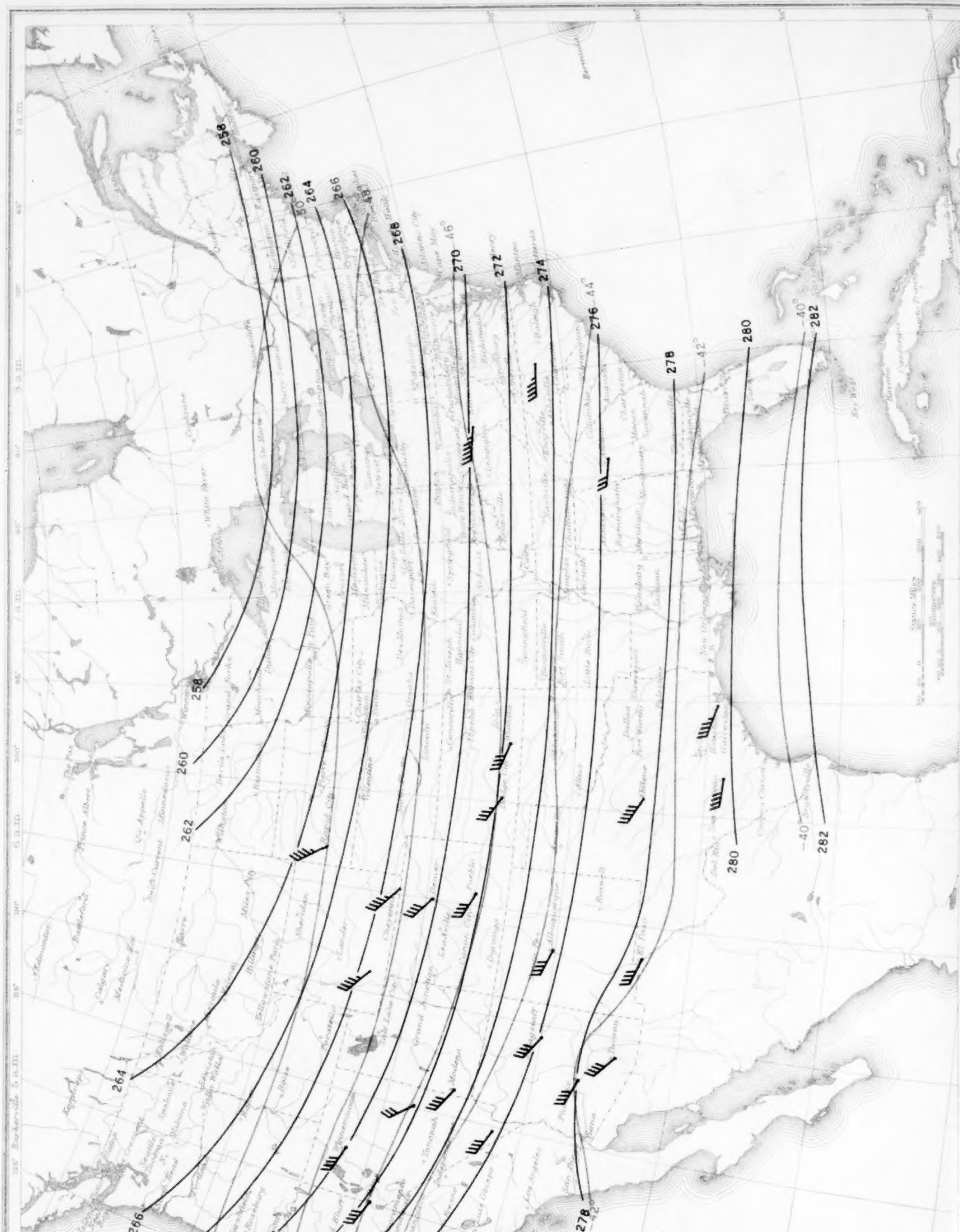


Chart XI. Isobars (mb) Isotherms (°C.) 1:00 a.m. (E. S. T.) and Resultant Winds 5:00 p.m. (E. S. T.) for 10,000 Meters (m. s. l.) November 1941